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# Crystal structures of five compounds in the aluminium–ruthenium–silicon system

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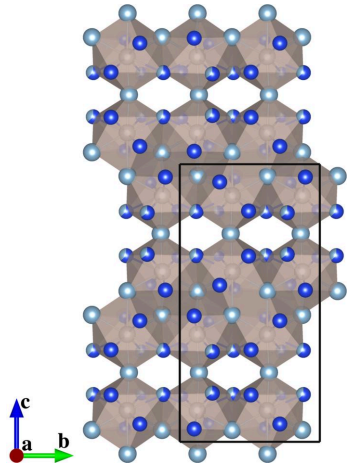
Single crystals of five compounds with approximate compositions $\sim Ru_{16}(Al_{0.78}Si_{0.22})_{47}$, (I), $\sim Ru_9(Al_{0.70}Si_{0.30})_{32}$, (II), $\sim Ru_{10}(Al_{0.67}Si_{0.33})_{41}$, (III), $\sim Ru(Al_{0.57}Si_{0.43})_5$, (IV), and $\sim Ru_2(Al_{0.46}Si_{0.54})_9$, (V), were obtained from polycrystalline lumps mainly composed of the target compounds, and their crystal structures were determined by means of single-crystal X-ray diffraction. The crystal structure of (I) can be related to that of a cubic rational crystalline approximant to an icosahedral quasicrystal through crystallographic shear and then unit-cell twinning. The crystal structure of (II) is isotypic with that of a phase with composition $\sim Fe_9(Al,Si)_{32}$. The crystal structure of (III) is comprised of edge-sharing $Ru(Al,Si)_{9–11}$ polyhedra with disordered chains along edges of polyhedra. The crystal structure of (IV) is of the $LiIrSn_4$ type. The crystal structure of (V) can be viewed as a crystallographic shear structure derived from that of (IV).

## 1. Chemical context

Semiconductors with complex crystal structures have attracted attention as thermoelectric materials (Snyder & Toberer, 2008; Zhang & Zhao, 2015; Liu *et al.*, 2017). To facilitate a search for such materials, knowledge on crystal structures is essential because it serves as a basis for understanding how semiconductivity and structural complexity meet in a material. Recently, a semiconducting compound with a complex crystal structure, which is considered a cubic rational crystalline approximant to an icosahedral quasicrystal, was discovered near the composition $Al_{67.6}Ru_{23.5}Si_{8.9}$ (Iwasaki *et al.*, 2019). Following this discovery, phase equilibria in the Al–Ru–Si system at 1200 K were thoroughly investigated, and eleven new ternary phases were identified (Kitahara *et al.*, 2023). In the course of these investigations, single crystals of five new compounds with approximate compositions $\sim Ru_{16}(Al_{0.78}Si_{0.22})_{47}$ (I), $\sim Ru_9(Al_{0.70}Si_{0.30})_{32}$ (II), $\sim Ru_{10}(Al_{0.67}Si_{0.33})_{41}$ (III), $\sim Ru(Al_{0.57}Si_{0.43})_5$ (IV) and $\sim Ru_2(Al_{0.46}Si_{0.54})_9$ (V) could be obtained from polycrystalline lumps mainly composed of the target compounds. Here we report the crystal structures of these compounds.




## 2. Structural commentary

The crystal structure of (I) consists of Ru-centred polyhedra with coordination numbers ranging from nine to eleven [Fig. 1(*a*–*e*, *g*–*i*)] and (Si,Ru)-centred icosahedra [Fig. 1(*f*)]. Each polyhedron is connected to three, four, five, six or fourteen others through face-sharing. A sensible represent-

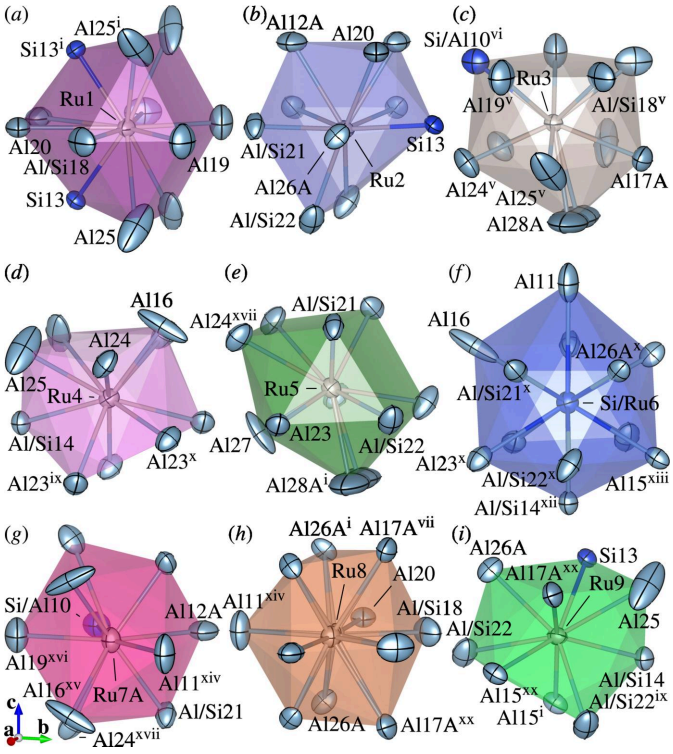



**Figure 1**
Coordination environments of (*a*) Ru1, (*b*) Ru2, (*c*) Ru3, (*d*) Ru4, (*e*) Ru5, (*f*) Si/Ru6, (*g*) Ru7, (*h*) Ru8 and (*i*) Ru9 in the crystal structure of (I) with displacement ellipsoids plotted at the 99% probability level. Unlabelled atoms in (*a*–*f*), (*g*) and (*h*) are related to the corresponding labelled atoms by (iii), (i) and (xix), respectively. Only the major disordered components are shown except for Ru8, Al20 and Al28*A*, for which two split components with equal occupancy are shown. Colour codes: Al and (Al/Si) (light blue); Ru (light brown); Si, (Si/Al) and (Si/Ru) (blue). [Symmetry codes: (i) $x, y, -z+\frac{1}{2}$; (iii) $-x, y, z$; (v) $-x+\frac{1}{2}, -y+\frac{1}{2}, z+\frac{1}{2}$; (vi) $-x, -y, -z+1$; (vii) $-x+\frac{1}{2}, -y+\frac{1}{2}, -z+1$; (ix) $-x+\frac{1}{2}, -y+\frac{1}{2}, -z$; (x) $-x+\frac{1}{2}, y+\frac{1}{2}, z$; (xii) $-x, -y+1, -z$; (xiii) $-x, -y+1, z-\frac{1}{2}$; (xiv) $x+\frac{1}{2}, y-\frac{1}{2}, -z+\frac{1}{2}$; (xv) $x+\frac{1}{2}, y-\frac{1}{2}, z$; (xvi) $-x+\frac{1}{2}, y-\frac{1}{2}, -z+\frac{1}{2}$; (xvii) $-x+\frac{1}{2}, y-\frac{1}{2}, z$; (xix) $-x+1, y, z$; (xx) $-x+\frac{1}{2}, -y+\frac{1}{2}, z-\frac{1}{2}$.]

ation of the crystal packing in (I) is obtained by using large structural units (clusters) [Fig. 2(*b*)] instead of using coordination polyhedra [Fig. 2(*a*)].

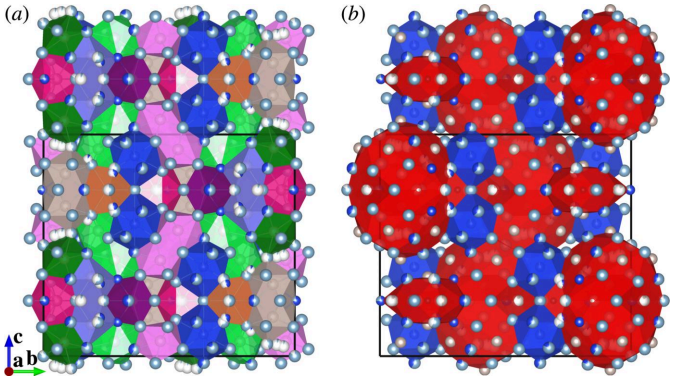



**Figure 2**
Packing diagrams for (I) based on (*a*) the coordination polyhedra given in Fig. 1 and (*b*) larger structural units (clusters).

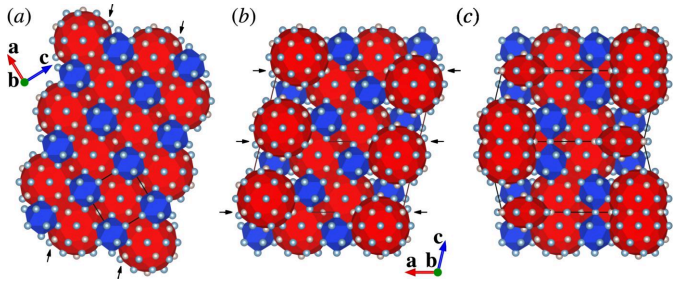



**Figure 3**
The structural units given in Fig. 2(*b*) as derived from (*a*) the parent cubic approximant structure by applying (*b*) crystallographic shear and then (*c*) unit-cell twinning. Shear planes [$(10\bar{1})$ planes of the parent structure] are indicated by arrows in (*a*). Twin planes [(001) planes of the sheared structure] are indicated by arrows in (*b*). Colour codes: icosahedral clusters (blue); pseudo-Mackay clusters (red).

The crystal structure of (I) can be related to that of a rational crystalline approximant to an icosahedral quasicrystal through crystallographic shear and then unit-cell twinning, as detailed in the following. The crystallographic shear and unit-cell twinning are two of the most important structure building operations by which a recombination structure is derived from a simpler parent structure (Lima-de-Faria *et al.*, 1990). In this case, the parent structure is a 1/0 cubic approximant to a Mackay-type icosahedral quasicrystal. Crystal structures of this type are known for the phases with approximate compositions ~$RhAl_{2.63}$ (ICSD 406525; Grin *et al.*, 1997), ~$IrAl_{2.75}$ (ICSD 406526; Grin *et al.*, 1997), ~$Al_{20.5}Ru_{5.1}Ni_{2.9}$ (ICSD 230569; Simura *et al.*, 2017) and ~$Al_{5.64}Fe_{0.96}Pd_{1.04}$ (ICSD 45248; Li & Fan, 2019). The crystal structure of the semiconducting compound ~$Al_{67.6}Ru_{23.5}Si_{8.9}$ is also considered to fall into this type (Iwasaki *et al.*, 2019). Fig. 3(*a*) shows an idealized crystal structure of this cubic approximant, which can be viewed as a CsCl-type packing of two types of clusters, icosahedral clusters and pseudo-Mackay clusters (Simura *et al.*, 2017). Fig. 3(*b*) shows a crystallographic shear structure derived from the parent structure. The shear planes are $(10\bar{1})$ planes of the parent structure [Fig. 3(*a*)], and the shear operation was applied at cluster level. Fig. 3(*c*) shows the crystal structure obtained by applying unit-cell twinning to the sheared structure. The twin planes are (001) planes of the sheared structure [Fig. 3(*b*)], and the twin operation was applied at the atomic level. Two constituent parts of the twinned structure are related by reflection across the twin planes as the mirror planes. Atoms close to each twin plane were shifted onto the plane prior to the twinning. The twinned structure is comparable to the cluster-based representation of (I) shown in Fig. 2(*b*). Note that the shear structure shown in Fig. 3(*b*) can also be obtained through so-called linear phason strain (Yamamoto, 1996) instead of crystallographic shear and hence directly relates to an icosahedral quasicrystal as a monoclinic approximant.

The crystal structure of (II) consists of two types of Ru-centred polyhedra, $RuAl_{12}$ cuboctahedra [Fig. 4(*a*)] and $Ru(Al,Si)_9$ square-face tricapped trigonal prisms [Fig. 4(*b*, *c*)]. Each cuboctahedron is surrounded by eight square-face

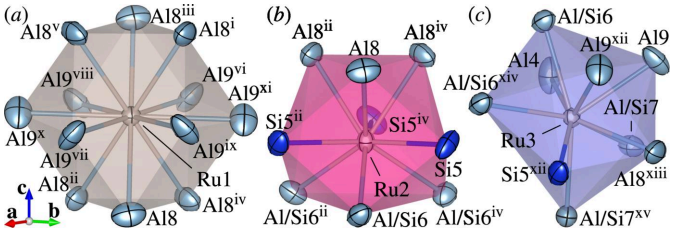



**Figure 4**
Coordination environments of (*a*) Ru1, (*b*) Ru2 and (*c*) Ru3 in the crystal structure of (II) with displacement ellipsoids plotted at the 99% probability level. Colour codes: Al and Al/Si (light blue); Ru (light brown); Si (blue). [Symmetry codes: (i) $x-y, x, -z+1$; (ii) $-x+y, -x, z$; (iii) $-x, -y, -z+1$; (iv) $-y, x-y, z$; (v) $y, -x+y, -z+1$; (vi) $y-\frac{2}{3}, -x+y-\frac{1}{3}, -z+\frac{2}{3}$; (vii) $-y+\frac{2}{3}, x-y+\frac{1}{3}, z+\frac{1}{3}$; (viii) $x-\frac{1}{3}, y-\frac{2}{3}, z+\frac{1}{3}$; (ix) $-x+\frac{1}{3}, -y+\frac{2}{3}, -z+\frac{2}{3}$; (*x*) $x-y+\frac{1}{3}, x-\frac{1}{3}, -z+\frac{2}{3}$; (xi) $-x+y-\frac{1}{3}, -x+\frac{1}{3}, z+\frac{1}{3}$; (xii) $x-y+\frac{2}{3}, x+\frac{1}{3}, -z+\frac{1}{3}$; (xiii) $-x+y+\frac{1}{3}, -x+\frac{2}{3}, z-\frac{1}{3}$; (xiv) $-x+\frac{2}{3}, -y+\frac{1}{3}, -z+\frac{1}{3}$; (xv) $y, -x+y, -z$.]

tricapped trigonal prisms sharing its eight triangular faces. Each square-face tricapped trigonal prism is in turn connected to others through edge-sharing.

The crystal structure of (III) is comprised of $Ru(Al,Si)_{10}$ [Fig. 5(*a*, *b*)], $Ru(Al,Si)_9$ [Fig. 5(*c*)] and $Ru(Al,Si)_{11}$ [Fig. 5(*d*–*g*)] polyhedra. Unlike the polyhedra in (I) and (II), no faces are shared between these polyhedra. These polyhedra are connected through edge-sharing. As an unusual feature, extensive positional disorder within a chain motif along edges of Ru4- and Ru5-centred polyhedra [Fig. 6(*a*)] is found in (III). A similar disordered chain structure [Fig. 6(*b*)] was also reported for the phase with approximate composition $\sim Fe_2Al_5$ (Burkhardt *et al.*, 1994; Vinokur *et al.*, 2019).

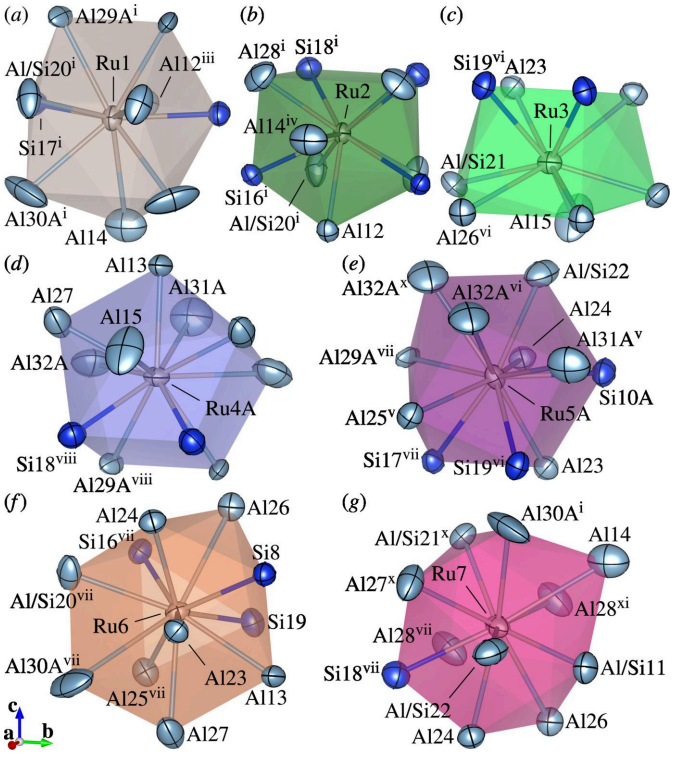



**Figure 5**
Coordination environments of (*a*) Ru1, (*b*) Ru2, (*c*) Ru3, (*d*) Ru4, (*e*) Ru5, (*f*) Ru6 and (*g*) Ru7 in the crystal structure of (III) with displacement ellipsoids plotted at the 99% probability level. Unlabelled atoms in (*a*–*d*) are related to the corresponding labelled atoms by (vii). Only the major disordered components are shown. Colour codes: Al and Al/Si (light blue); Ru (light brown); Si (blue). [Symmetry codes: (i) $-x+\frac{1}{2}, y-\frac{1}{2}, z+\frac{1}{2}$; (iii) $x-\frac{1}{2}, y, -z+\frac{3}{2}$; (iv) $x+\frac{1}{2}, y, -z+\frac{3}{2}$; (v) $x+\frac{1}{2}, -y+\frac{1}{2}, -z+\frac{1}{2}$; (vi) $x+\frac{1}{2}, y, -z+\frac{1}{2}$; (vii) $x, -y+\frac{1}{2}, z$; (viii) $-x+\frac{1}{2}, y-\frac{1}{2}, z-\frac{1}{2}$; (*x*) $-x+\frac{1}{2}, -y, z+\frac{1}{2}$; (xi) $-x, y-\frac{1}{2}, -z+1$.]

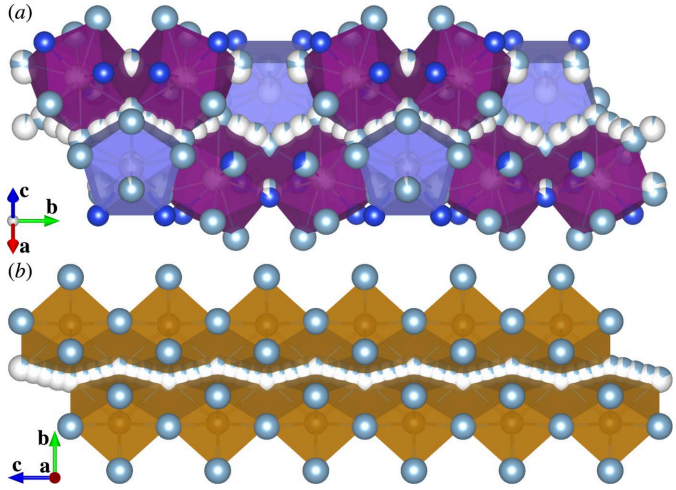



**Figure 6**
Disordered chains along polyhedral edges (*a*) in the crystal structure of (III) and (*b*) in $\sim Fe_2Al_5$ (CCDC 1880447; Vinokur *et al.*, 2019). Colour codes: Al (light blue); Fe (brown); Ru (light brown); Si (blue).

The crystal structures of (IV) and (V) consist of $Ru(Al,Si)_{10}$ bicapped square antiprisms [Fig. 7(*a*, *b*)]. In both crystal structures, the two cap positions of each polyhedron [Al2$^{i}$ and Al2 in Fig. 7(*a*); Al6 and Al8$^{iv}$ in Fig. 7(*b*)] are occupied solely by Al, and each polyhedron is connected to four others in the (001) plane through edge-sharing. Along the [001] direction, each polyhedron is connected to two others sharing its vertices

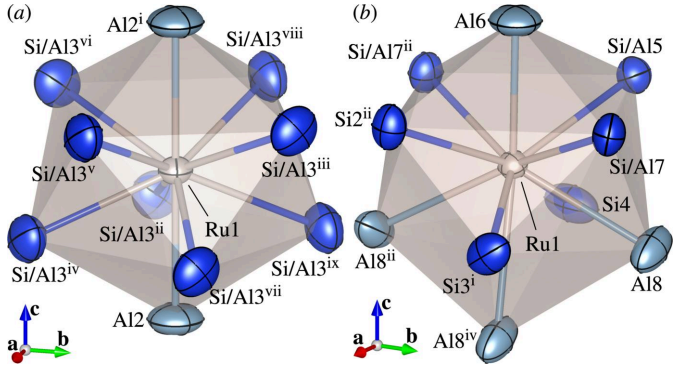



**Figure 7**
Coordination environments of (*a*) Ru1 in the crystal structure of (IV) [symmetry codes: (i) $-x, y, -z+\frac{1}{2}$; (ii) $y-1, -x, z$; (iii) $y-\frac{1}{2}, -x+\frac{1}{2}, -z+\frac{1}{2}$; (iv) $x, y-1, z$; (v) $-x+\frac{1}{2}, -y+\frac{1}{2}, -z+\frac{1}{2}$; (vi) $-y+\frac{1}{2}, x-\frac{1}{2}, -z+\frac{1}{2}$; (vii) $-y+1, x, z$; (viii) $x-\frac{1}{2}, y-\frac{1}{2}, -z+\frac{1}{2}$; (ix) $-x, -y+1, z$] and (*b*) Ru1 in the crystal structure of (V) [symmetry codes: (i) $-x+\frac{1}{2}, -y+\frac{1}{2}, z-\frac{1}{2}$; (ii) $-x+\frac{1}{2}, y-\frac{1}{2}, z$; (iv) $-x+\frac{1}{2}, -y+\frac{1}{2}, -z$] with displacement ellipsoids plotted at the 99% probability level. Colour codes: Al (light blue); Ru (light brown); Si and Si/Al (blue).

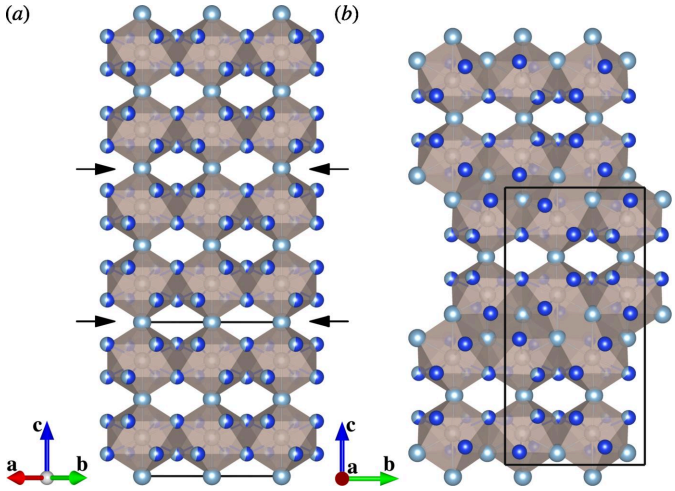



**Figure 8**
Packing diagrams for the crystal structures (*a*) of (IV) and (*b*) of (V). Crystallographic shear planes [(001) planes of (IV)] are indicated by arrows in (*a*). Colour codes: Al (light blue); Ru (light brown); Si (blue).

at the two cap positions in (IV) [Fig. 8(*a*)], while each polyhedron is connected to one another through vertex-sharing and two others through edge-sharing in (V) [Fig. 8(*b*)]. The structure of (V) can be viewed as a crystallographic shear structure derived from that of (IV). The corresponding shear planes are (001) planes of (IV) [Fig. 8(*a*)].

## 3. Database survey

Searches for isotypic crystal structures to those of the five compounds were carried out using the Inorganic Crystal Structure Database (ICSD, version 4.9.0; Zagorac *et al.*, 2019). For (I), (III) and (V), queries for structures with the Pearson symbols *oS*250–254, *oP*200–204 and *oS*88, respectively, were made, but no entries for isotypic crystals were found. For (II), a query for *hR*41 was made, and three nearly identical structures (ICSD 99169; Sugiyama *et al.*, 2004; ICSD 423182, 423183; Roger *et al.*, 2011) of the crystal ~$Fe_9(Al,Si)_{32}$ were found. Although isotypism is indicated between (II) and ~$Fe_9(Al,Si)_{32}$, unlike in (II), the centres of the cuboctahedra are not occupied solely by transition-metal atoms in these structures. For (IV), a query for *tI*24 was made, and some isotypic crystals of the $LiIrSn_4$ type (ICSD 412252; Wu *et al.*, 2002) were found. Limiting the results to Al-containing crystal structures, isotypic crystals in the Al–Fe–Si (ICSD 79709; Gueneau *et al.*, 1995; ICSD 4837, 4839; Zhou *et al.*, 2018), Al–Fe–Ge (ICSD 235910; Reisinger *et al.*, 2018) and Al–Ge–Mn (ICSD 8608; Sasaki *et al.*, 2019) systems were found. In these structures and that of (IV), the Li sites of the $LiIrSn_4$-type structure are occupied solely by Al, whereas the Sn sites are occupied by (Al,Si) or (Al,Ge).

## 4. Synthesis and crystallization

Polycrystalline samples with the nominal compositions $Al_{58.0}Ru_{25.3}Si_{16.7}$ for (I) and $Al_{37.5}Ru_{17.8}Si_{44.7}$ for (V) were prepared from powders of aluminium (Kojundo Chemical Lab., Japan, 99.9%), ruthenium (Tanaka Kikinzoku Kogyo K. K., Japan, 99.90% or purer) and silicon (Kojundo Chemical Lab., Japan, 99.99% or purer) using arc melting in an argon atmosphere (NEV-ACD-05, Nissin Giken Corporation, Japan). Each sample was then wrapped in tantalum foil, sealed in a silica tube filled with argon and annealed in a furnace at 1200 K for approximately 264 h, followed by water quenching. Powders for polycrystalline samples with the nominal compositions $Al_{55.5}Ru_{21.7}Si_{22.8}$ for (II), $Al_{55.0}Ru_{19.2}Si_{25.8}$ for (III) and $Al_{48.0}Ru_{16.2}Si_{35.8}$ for (IV) were mechanically compacted without melting. Each sample was then placed in an aluminium nitride crucible, sealed in a silica tube filled with argon and reacted in a furnace at 1200 K for approximately 160 h or longer, followed by water quenching. Single crystals were selected from crushed fragments of the polycrystalline samples (lumps), which are mainly composed of the target compounds. The compositions of the target compounds in the samples were analysed as described elsewhere (Kitahara *et al.*, 2023) using an energy-dispersive spectrometer (X-Max, Oxford Instruments, UK) equipped in a scanning electron microscope (SU6600, Hitachi High-Technologies Corporation, Japan). Determined compositions for equilibria at 1200 K are $Al_{58.2\ (5)}Ru_{25.1\ (4)}Si_{16.7\ (3)}$ for (I), $Al_{55.2\ (6)}Ru_{21.6\ (4)}Si_{23.1\ (7)}$ for (II), $Al_{54.1\ (5)}Ru_{19.6\ (3)}Si_{26.3\ (4)}$ for (III), $Al_{47.3\ (6)}Ru_{16.3\ (3)}Si_{36.4\ (6)}$ for (IV) and $Al_{38.0\ (5)}Ru_{17.8\ (3)}Si_{44.2\ (6)}$ for (V). These compositions are similar to the nominal compositions and consistent with the approximate single-phase regions [from $Al_{62}Ru_{25}Si_{13}$ to $Al_{56}Ru_{26}Si_{18}$ for (I), from $Al_{57}Ru_{22}Si_{21}$ to $Al_{54}Ru_{22}Si_{24}$ for (II), from $Al_{55}Ru_{20}Si_{25}$ to $Al_{54}Ru_{20}Si_{26}$ for (III), from $Al_{49}Ru_{17}Si_{34}$ to $Al_{47}Ru_{17}Si_{36}$ for (IV) and from $Al_{41}Ru_{18}Si_{41}$ to $Al_{37}Ru_{18}Si_{45}$ for (V)] (Kitahara *et al.*, 2023).

## 5. Refinement

Crystal data, data collection and structure refinement details are summarized in Table 1.

For (I) and (III), significant residual electron density peaks were found around some sites after routine structure refinement procedures. To account for these peaks, some split sites were introduced for (I) [Ru7*B* from Ru7*A*; Ru8 (Wyckoff position changed into 8*g* from 4*c*); Al12*B* from Al12*A*; Si17*B* from Al17*A*; Si26*B* from Al26*A*; Al28*A* (16*h* from 8*f*); Al28*B* and Al28*C* from Al28*A*] and (III) [Ru4*B* from Ru4*A*; Ru5*B* from Ru5*A*; Si9*B* from Si9*A*; Al10*B* from Si10*A*; Al29*B* from Al29*A*; Al30*B* from Al30*A*; Al31*B* and Al31*C* from Al31*A*; Al32*B* from Al32*A*]. Anisotropic displacement parameters were not introduced for minor split components [Ru7*B*, Al12*B*, Si17*B*, Si26*B*, Al28*B* and Al28*C* in (I); Ru4*B*, Ru5*B*, Al10*B*, Al29*B*, Al30*B*, Al31*B*, Al31*C* and Al32*B* in (III)] except for Si9*B* in (III).

Choices of Al, Si or (Al,Si) mixing were basically based on the site-occupancy factors (SOFs). After routine structure-refinement procedures and adding split sites, the SOF of each site was refined independently one by one. (Al,Si) mixing was introduced for some sites for (I) (Si/Al10, Al/Si14, Al/Si18, Al/

**Table 1**
Experimental details.

| | (I) | (II) | (III) | (IV) | (V) |
|---|---|---|---|---|---|
| Crystal data | | | | | |
| Chemical formula | $\sim Ru_{16}(Al_{0.78}Si_{0.22})_{47}$ | $\sim Ru_9(Al_{0.70}Si_{0.30})_{32}$ | $\sim Ru_{10}(Al_{0.67}Si_{0.33})_{41}$ | $\sim Ru(Al_{0.57}Si_{0.43})_5$ | $\sim Ru_2(Al_{0.46}Si_{0.54})_9$ |
| $M_r$ | 2900.59 | 1783.65 | 2122.53 | 238.38 | 450.41 |
| Crystal system, space group | Orthorhombic, *Cmcm* | Trigonal, $R\bar{3}$ | Orthorhombic, *Pnma* | Tetragonal, *I*4/*mcm* | Orthorhombic, *Cmcm* |
| Temperature (K) | 301 | 296 | 298 | 297 | 301 |
| *a*, *b*, *c* (Å) | 7.6217 (2), 23.4434 (6), 20.6877 (6) | 10.4479 (2), 10.4479 (2), 19.6774 (4) | 15.0794 (2), 11.8713 (2), 16.9291 (3) | 6.20079 (8), 6.20079 (8), 9.6937 (2) | 8.63058 (14), 8.79888 (15), 17.4620 (3) |
| $\alpha$, $\beta$, $\gamma$ (°) | 90, 90, 90 | 90, 90, 120 | 90, 90, 90 | 90, 90, 90 | 90, 90, 90 |
| $V$ (Å$^3$) | 3696.46 (19) | 1860.17 (7) | 3030.50 (9) | 372.72 (1) | 1326.05 (4) |
| $Z$ | 4 | 3 | 4 | 4 | 8 |
| Radiation type | Mo $K\alpha$ | Mo $K\alpha$ | Mo $K\alpha$ | Mo $K\alpha$ | Mo $K\alpha$ |
| $\mu$ (mm$^{-1}$) | 7.59 | 6.59 | 6.18 | 5.32 | 5.88 |
| Crystal size (mm) | 0.04 × 0.02 × 0.02 | 0.03 × 0.03 × 0.03 | 0.04 × 0.02 × 0.02 | 0.05 × 0.03 × 0.02 | 0.05 × 0.04 × 0.04 |
| Data collection | | | | | |
| Diffractometer | XtaLAB Synergy R, HyPix | XtaLAB Synergy R, HyPix | XtaLAB Synergy R, HyPix | XtaLAB Synergy R, HyPix | XtaLAB Synergy R, HyPix |
| Absorption correction | Gaussian (*CrysAlis PRO*; Matsumoto *et al.*, 2021) | Gaussian (*CrysAlis PRO*; Matsumoto *et al.*, 2021) | Gaussian (*CrysAlis PRO*; Matsumoto *et al.*, 2021) | Gaussian (*CrysAlis PRO*; Matsumoto *et al.*, 2021) | Gaussian (*CrysAlis PRO*; Matsumoto *et al.*, 2021) |
| $T_{min}$, $T_{max}$ | 0.824, 0.924 | 0.868, 0.879 | 0.867, 0.929 | 0.833, 0.906 | 0.826, 0.868 |
| No. of measured, independent and observed [$I > 2\sigma(I)$] reflections | 11822, 2616, 2280 | 14255, 1193, 1127 | 33654, 5672, 4940 | 8063, 295, 279 | 17672, 1029, 1001 |
| $R_{int}$ | 0.020 | 0.027 | 0.022 | 0.029 | 0.016 |
| $(\sin\theta/\lambda)_{max}$ (Å$^{-1}$) | 0.718 | 0.720 | 0.781 | 0.864 | 0.719 |
| Refinement | | | | | |
| $R[F^2 > 2\sigma(F^2)]$, $wR(F^2)$, $S$ | 0.015, 0.032, 1.04 | 0.013, 0.024, 1.08 | 0.015, 0.026, 1.01 | 0.009, 0.021, 1.21 | 0.011, 0.027, 1.31 |
| No. of reflections | 2616 | 1193 | 5672 | 295 | 1029 |
| No. of parameters | 218 | 66 | 303 | 13 | 61 |
| No. of restraints | 5 | 2 | 2 | 2 | 2 |
| $\Delta\rho_{max}$, $\Delta\rho_{min}$ (e Å$^{-3}$) | 0.64, −0.69 | 0.45, −0.53 | 0.78, −0.74 | 0.44, −0.42 | 0.37, −0.42 |

Computer programs: *CrysAlis PRO* (Matsumoto *et al.*, 2021), *SHELXT* (Sheldrick, 2015*a*), *SHELXL* (Sheldrick, 2015*b*), *VESTA* (Momma & Izumi, 2011) and *publCIF* (Westrip, 2010).

Si21 and Al/Si22), (II) (Al/Si6 and Al/Si7), (III) (Al/Si11, Al/Si20, Al/Si21 and Al/Si22), (IV) (Si/Al3) and (V) (Si/Al5 and Si/Al7) because the SOF becomes significantly higher than 1 with Al occupation only and lower than 1 with Si occupation only for these sites. The positions and displacement parameters of mixing components were constrained using EXYZ and EADP instructions of *SHELXL* (Sheldrick, 2015*b*). For split sites, (Al,Si) mixing was not introduced, and Al or Si was chosen for each site so that the sum of the SOFs of the split components are close to 1. Choice of Si for Si/Ru6 in (I) is rather arbitrary, and it may be Al or even a vacancy.

After assigning chemical species to each site, the sum of the SOFs for each group of mixed or split sites was constrained to 1 unless it was significantly lower than 1. Sites with SOFs lower than 1 were found for (I) (Al27) and (III) (Al15), and the SOFs for these sites were freely refined. For sites along disordered chains in (III) [Al31*A*, Al31*B*, Al31*C*, Al32*A* and Al32*B*; see also *Structural commentary* and Fig. 6(*a*)], there is no *a priori* expected value for the sum of the SOFs, and therefore the SOFs of these sites were refined without any constraints. For these partially occupied sites, the assignment as Al is by no means justified, and some of them may be occupied by Si.

Since it is generally difficult to distinguish between Al and Si solely from X-ray diffraction data, restraints on the chemical compositions based on the chemical analysis data including their uncertainties (see *Synthesis and crystallization*) were introduced using SUMP instructions of *SHELXL* (Sheldrick, 2015*b*) for the final refinement cycles. The compositions deduced from the final refinement are $Al_{57.8\,(3)}Ru_{25.6}Si_{16.6\,(3)}$ for (I), $Al_{54.8\,(5)}Ru_{22.0}Si_{23.3\,(5)}$ for (II), $Al_{53.6\,(3)}Ru_{19.7}Si_{26.6\,(3)}$ for (III), $Al_{47.2\,(5)}Ru_{16.7}Si_{36.1\,(5)}$ for (IV) and $Al_{37.2\,(4)}Ru_{18.2}Si_{44.6\,(4)}$ for (V). These compositions are consistent with the chemical analysis data.

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# supporting information

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## Crystal structures of five compounds in the aluminium–ruthenium–silicon system

**Koichi Kitahara, Hiroyuki Takakura, Yutaka Iwasaki and Kaoru Kimura**

### Computing details

For all structures, data collection: *CrysAlis PRO* (Matsumoto *et al.*, 2021); cell refinement: *CrysAlis PRO* (Matsumoto *et al.*, 2021); data reduction: *CrysAlis PRO* (Matsumoto *et al.*, 2021); program(s) used to solve structure: *SHELXT* (Sheldrick, 2015a); program(s) used to refine structure: *SHELXL* (Sheldrick, 2015b); molecular graphics: *VESTA* (Momma & Izumi, 2011); software used to prepare material for publication: *publCIF* (Westrip, 2010).

### Hexatriacontaaluminium hexadecaruthenium decasilicon (I)

*Crystal data*

$\sim Ru_{16}(Al_{0.78}Si_{0.22})_{47}$
$M_r$ = 2900.59
Orthorhombic, *Cmcm*
*a* = 7.6217 (2) Å
*b* = 23.4434 (6) Å
*c* = 20.6877 (6) Å
*V* = 3696.46 (19) Å$^3$
*Z* = 4
*F*(000) = 5237.80
$D_x$ = 5.212 Mg m$^{-3}$
Mo *Kα* radiation, $\lambda$ = 0.71073 Å
Cell parameters from 5906 reflections
$\theta$ = 2.6–30.8°
$\mu$ = 7.59 mm$^{-1}$
*T* = 301 K
Prism, metallic light colourless
0.04 × 0.02 × 0.02 mm

*Data collection*

XtaLAB Synergy R, HyPix diffractometer
Radiation source: micro-focus sealed X-ray tube, Mova (Mo) X-ray Source
Mirror monochromator
Detector resolution: 10.0000 pixels mm$^{-1}$
$\omega$ scans
Absorption correction: gaussian (CrysAlisPro; Matsumoto *et al.*, 2021)
$T_{min}$ = 0.824, $T_{max}$ = 0.924
11822 measured reflections
2616 independent reflections
2280 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.020
$\theta_{max}$ = 30.7°, $\theta_{min}$ = 1.7°
*h* = −9→7
*k* = −32→33
*l* = −22→27

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.015
$wR(F^2)$ = 0.032
*S* = 1.04
2616 reflections
218 parameters
5 restraints
Primary atom site location: dual
Secondary atom site location: difference Fourier map
$w = 1/[\sigma^2(F_o^2) + (0.015P)^2 + 1.7856P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.002
$\Delta\rho_{max}$ = 0.64 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.69 e Å$^{-3}$

Extinction correction: SHELXL-2019/3 (Sheldrick, 2015b), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$
Extinction coefficient: 0.000036 (4)

*Special details*

**Geometry**. All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²)*

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| Ru1 | 0.000000 | 0.35437 (2) | 0.250000 | 0.00702 (8) | |
| Ru2 | 0.000000 | 0.19071 (2) | 0.14245 (2) | 0.00523 (6) | |
| Ru3 | 0.000000 | 0.08703 (2) | 0.67676 (2) | 0.00497 (6) | |
| Ru4 | 0.000000 | 0.46501 (2) | 0.06755 (2) | 0.00580 (6) | |
| Ru5 | 0.000000 | 0.08260 (2) | 0.06182 (2) | 0.00605 (6) | |
| Si6 | 0.000000 | 0.63703 (3) | 0.09750 (4) | 0.0067 (3) | 0.9481 (19) |
| Ru6 | 0.000000 | 0.63703 (3) | 0.09750 (4) | 0.0067 (3) | 0.0519 (19) |
| Ru7A | 0.2872 (5) | 0.05250 (15) | 0.250000 | 0.0071 (3) | 0.87 (3) |
| Ru7B | 0.308 (2) | 0.0461 (8) | 0.250000 | 0.0123 (19)* | 0.13 (3) |
| Ru8 | 0.4748 (2) | 0.24633 (2) | 0.250000 | 0.0057 (4) | 0.5 |
| Ru9 | 0.20167 (2) | 0.28208 (2) | 0.06561 (2) | 0.00560 (5) | |
| Si10 | 0.000000 | 0.00419 (5) | 0.250000 | 0.0088 (6) | 0.73 (12) |
| Al10 | 0.000000 | 0.00419 (5) | 0.250000 | 0.0088 (6) | 0.27 (12) |
| Al11 | 0.000000 | 0.63795 (6) | 0.250000 | 0.0132 (3) | |
| Al12A | 0.000000 | 0.12915 (10) | 0.250000 | 0.0126 (9) | 0.856 (12) |
| Al12B | 0.079 (3) | 0.1477 (10) | 0.250000 | 0.020 (5)* | 0.072 (6) |
| Si13 | 0.000000 | 0.29501 (3) | 0.15414 (4) | 0.00569 (17) | |
| Al14 | 0.000000 | 0.36199 (4) | 0.03013 (4) | 0.0068 (4) | 0.59 (8) |
| Si14 | 0.000000 | 0.36199 (4) | 0.03013 (4) | 0.0068 (4) | 0.41 (8) |
| Al15 | 0.000000 | 0.25809 (4) | 0.53285 (5) | 0.00662 (19) | |
| Al16 | 0.000000 | 0.52766 (5) | 0.16337 (5) | 0.0189 (2) | |
| Al17A | 0.000000 | 0.19089 (7) | 0.63750 (11) | 0.0091 (5) | 0.908 (9) |
| Si17B | 0.000000 | 0.1757 (7) | 0.6124 (11) | 0.012 (4)* | 0.092 (9) |
| Al18 | 0.32754 (14) | 0.33805 (4) | 0.250000 | 0.0126 (5) | 0.52 (9) |
| Si18 | 0.32754 (14) | 0.33805 (4) | 0.250000 | 0.0126 (5) | 0.48 (9) |
| Al19 | 0.20942 (15) | 0.44221 (4) | 0.250000 | 0.0133 (2) | |
| Al20 | 0.1113 (3) | 0.23957 (8) | 0.250000 | 0.0096 (4) | 0.5 |
| Al21 | 0.20919 (10) | 0.10789 (3) | 0.15319 (3) | 0.0089 (3) | 0.63 (5) |
| Si21 | 0.20919 (10) | 0.10789 (3) | 0.15319 (3) | 0.0089 (3) | 0.37 (5) |
| Al22 | 0.18810 (10) | 0.17255 (3) | 0.03759 (4) | 0.0119 (3) | 0.81 (6) |
| Si22 | 0.18810 (10) | 0.17255 (3) | 0.03759 (4) | 0.0119 (3) | 0.19 (6) |
| Al23 | 0.31517 (10) | 0.05413 (3) | 0.03152 (3) | 0.00897 (14) | |
| Al24 | 0.31724 (10) | 0.49470 (3) | 0.13170 (4) | 0.01044 (15) | |
| Al25 | 0.18885 (12) | 0.38526 (3) | 0.13490 (4) | 0.0223 (2) | |
| Al26A | 0.3202 (4) | 0.21649 (10) | 0.1531 (2) | 0.0070 (7) | 0.593 (13) |

| | | | | | |
|---|---|---|---|---|---|
| Si26B | 0.2898 (5) | 0.22406 (13) | 0.1730 (3) | 0.0125 (7)* | 0.407 (13) |
| Al27 | 0.000000 | 0.000000 | 0.000000 | 0.0161 (6) | 0.853 (7) |
| Al28A | 0.0495 (3) | 0.10981 (8) | 0.55507 (9) | 0.0328 (10) | 0.445 (3) |
| Al28B | 0.000000 | 0.0716 (12) | 0.5512 (8) | 0.008 (6)* | 0.064 (7) |
| Al28C | 0.000000 | 0.0454 (15) | 0.5436 (12) | 0.011 (9)* | 0.046 (7) |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ru1 | 0.0119 (2) | 0.00458 (16) | 0.00454 (16) | 0.000 | 0.000 | 0.000 |
| Ru2 | 0.00655 (14) | 0.00520 (11) | 0.00395 (12) | 0.000 | 0.000 | −0.00041 (8) |
| Ru3 | 0.00556 (14) | 0.00514 (11) | 0.00421 (12) | 0.000 | 0.000 | 0.00000 (9) |
| Ru4 | 0.00580 (13) | 0.00635 (11) | 0.00525 (12) | 0.000 | 0.000 | 0.00106 (9) |
| Ru5 | 0.00665 (14) | 0.00574 (11) | 0.00577 (12) | 0.000 | 0.000 | −0.00051 (9) |
| Si6 | 0.0058 (5) | 0.0074 (4) | 0.0068 (4) | 0.000 | 0.000 | 0.0002 (3) |
| Ru6 | 0.0058 (5) | 0.0074 (4) | 0.0068 (4) | 0.000 | 0.000 | 0.0002 (3) |
| Ru7A | 0.0063 (5) | 0.0058 (5) | 0.0090 (3) | −0.0001 (3) | 0.000 | 0.000 |
| Ru8 | 0.0052 (11) | 0.00544 (18) | 0.00647 (19) | 0.0004 (2) | 0.000 | 0.000 |
| Ru9 | 0.00554 (10) | 0.00702 (8) | 0.00425 (9) | 0.00082 (6) | 0.00052 (7) | 0.00001 (6) |
| Si10 | 0.0060 (9) | 0.0114 (8) | 0.0092 (8) | 0.000 | 0.000 | 0.000 |
| Al10 | 0.0060 (9) | 0.0114 (8) | 0.0092 (8) | 0.000 | 0.000 | 0.000 |
| Al11 | 0.0105 (8) | 0.0060 (6) | 0.0230 (8) | 0.000 | 0.000 | 0.000 |
| Al12A | 0.0192 (17) | 0.0135 (11) | 0.0053 (9) | 0.000 | 0.000 | 0.000 |
| Si13 | 0.0069 (5) | 0.0054 (4) | 0.0047 (4) | 0.000 | 0.000 | −0.0008 (3) |
| Al14 | 0.0073 (6) | 0.0053 (6) | 0.0080 (6) | 0.000 | 0.000 | −0.0001 (3) |
| Si14 | 0.0073 (6) | 0.0053 (6) | 0.0080 (6) | 0.000 | 0.000 | −0.0001 (3) |
| Al15 | 0.0045 (5) | 0.0090 (4) | 0.0064 (4) | 0.000 | 0.000 | 0.0019 (3) |
| Al16 | 0.0037 (6) | 0.0390 (7) | 0.0140 (5) | 0.000 | 0.000 | −0.0183 (5) |
| Al17A | 0.0124 (7) | 0.0060 (7) | 0.0090 (10) | 0.000 | 0.000 | 0.0011 (6) |
| Al18 | 0.0091 (7) | 0.0167 (6) | 0.0120 (6) | 0.0067 (4) | 0.000 | 0.000 |
| Si18 | 0.0091 (7) | 0.0167 (6) | 0.0120 (6) | 0.0067 (4) | 0.000 | 0.000 |
| Al19 | 0.0138 (6) | 0.0084 (5) | 0.0178 (5) | −0.0024 (4) | 0.000 | 0.000 |
| Al20 | 0.0142 (12) | 0.0092 (9) | 0.0055 (9) | 0.0019 (7) | 0.000 | 0.000 |
| Al21 | 0.0103 (5) | 0.0068 (4) | 0.0095 (4) | 0.0021 (2) | −0.0039 (3) | −0.0005 (2) |
| Si21 | 0.0103 (5) | 0.0068 (4) | 0.0095 (4) | 0.0021 (2) | −0.0039 (3) | −0.0005 (2) |
| Al22 | 0.0112 (5) | 0.0097 (4) | 0.0148 (5) | 0.0015 (3) | 0.0059 (3) | 0.0041 (3) |
| Si22 | 0.0112 (5) | 0.0097 (4) | 0.0148 (5) | 0.0015 (3) | 0.0059 (3) | 0.0041 (3) |
| Al23 | 0.0091 (4) | 0.0088 (3) | 0.0090 (3) | 0.0011 (2) | 0.0030 (3) | 0.0015 (2) |
| Al24 | 0.0091 (4) | 0.0099 (3) | 0.0123 (3) | 0.0018 (3) | −0.0013 (3) | 0.0042 (3) |
| Al25 | 0.0262 (5) | 0.0121 (4) | 0.0285 (5) | −0.0080 (3) | −0.0213 (4) | 0.0051 (3) |
| Al26A | 0.0040 (9) | 0.0086 (7) | 0.0084 (13) | −0.0013 (5) | −0.0024 (8) | 0.0017 (7) |
| Al27 | 0.0105 (11) | 0.0136 (10) | 0.0243 (11) | 0.000 | 0.000 | −0.0147 (7) |
| Al28A | 0.069 (3) | 0.0227 (11) | 0.0063 (8) | 0.0029 (9) | 0.0017 (9) | −0.0007 (6) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ru1—Si13 | 2.4228 (9) | Ru9—Si26B | 2.690 (3) |
| Ru1—Si13$^{i}$ | 2.4228 (9) | Ru9—Al17A$^{xx}$ | 2.7899 (10) |

| | | | |
|---|---|---|---|
| Ru1—Si18 | 2.5255 (10) | Si10—Al19$^{xxi}$ | 2.6487 (13) |
| Ru1—Al18$^{ii}$ | 2.5255 (10) | Si10—Al19$^{xvi}$ | 2.6487 (13) |
| Ru1—Al19 | 2.6055 (11) | Si10—Al24$^{xxi}$ | 2.8248 (7) |
| Ru1—Al19$^{ii}$ | 2.6056 (10) | Si10—Al24$^{xvi}$ | 2.8248 (7) |
| Ru1—Al20$^{ii}$ | 2.8218 (19) | Si10—Al24$^{xvii}$ | 2.8248 (7) |
| Ru1—Al20 | 2.8218 (19) | Si10—Al24$^{xxii}$ | 2.8248 (7) |
| Ru1—Al25 | 2.8750 (10) | Al12A—Al12B$^{ii}$ | 0.74 (3) |
| Ru1—Al25$^{i}$ | 2.8750 (10) | Al12A—Al12B | 0.74 (3) |
| Ru1—Al25$^{iii}$ | 2.8750 (10) | Al12A—Al21$^{iii}$ | 2.6080 (9) |
| Ru2—Si26B | 2.427 (3) | Al12A—Al21$^{i}$ | 2.6080 (9) |
| Ru2—Si26B$^{iii}$ | 2.427 (3) | Al12A—Al21$^{ii}$ | 2.6080 (9) |
| Ru2—Si13 | 2.4571 (8) | Al12A—Al21 | 2.6080 (9) |
| Ru2—Al12B | 2.515 (9) | Al12A—Al20 | 2.724 (3) |
| Ru2—Al12B$^{ii}$ | 2.515 (9) | Al12A—Al20$^{ii}$ | 2.724 (3) |
| Ru2—Al21$^{iii}$ | 2.5221 (7) | Al12B—Al12B$^{ii}$ | 1.20 (5) |
| Ru2—Al21 | 2.5222 (7) | Al12B—Al20 | 2.17 (2) |
| Ru2—Al26A$^{iii}$ | 2.524 (2) | Al12B—Al21$^{i}$ | 2.423 (11) |
| Ru2—Al26A | 2.524 (2) | Al12B—Al21 | 2.423 (11) |
| Ru2—Al22 | 2.6349 (7) | Al12B—Al20$^{ii}$ | 2.595 (19) |
| Ru3—Si17B | 2.469 (11) | Al12B—Si26B$^{i}$ | 2.89 (2) |
| Ru3—Al24$^{iv}$ | 2.5456 (7) | Al12B—Si26B | 2.89 (2) |
| Ru3—Al24$^{v}$ | 2.5456 (7) | Si13—Al20$^{ii}$ | 2.5183 (14) |
| Ru3—Al17A | 2.5668 (13) | Si13—Al20 | 2.5183 (14) |
| Ru3—Al28A$^{iii}$ | 2.6011 (18) | Si13—Al25 | 2.5897 (10) |
| Ru3—Al28A | 2.6011 (18) | Si13—Al25$^{iii}$ | 2.5898 (10) |
| Ru3—Al25$^{iv}$ | 2.6069 (8) | Si13—Si26B | 2.793 (4) |
| Ru3—Al25$^{v}$ | 2.6069 (8) | Si13—Si26B$^{iii}$ | 2.793 (4) |
| Ru3—Si10$^{vi}$ | 2.6207 (11) | Al14—Al25 | 2.6585 (11) |
| Ru3—Al28B | 2.623 (18) | Al14—Al25$^{iii}$ | 2.6585 (11) |
| Ru3—Al18$^{vii}$ | 2.6662 (9) | Al14—Al23$^{ix}$ | 2.7345 (10) |
| Ru3—Al18$^{iv}$ | 2.6662 (9) | Al14—Al23$^{viii}$ | 2.7345 (10) |
| Ru4—Al16 | 2.4671 (11) | Al14—Al15$^{i}$ | 2.7624 (13) |
| Ru4—Al23$^{viii}$ | 2.5271 (7) | Al14—Al22$^{viii}$ | 2.8756 (9) |
| Ru4—Al23$^{ix}$ | 2.5271 (7) | Al14—Al22$^{ix}$ | 2.8756 (9) |
| Ru4—Al14 | 2.5361 (9) | Al15—Si17B | 2.538 (12) |
| Ru4—Al23$^{x}$ | 2.6278 (7) | Al15—Al17A | 2.6774 (16) |
| Ru4—Al23$^{xi}$ | 2.6278 (7) | Al15—Al22$^{ii}$ | 2.8634 (11) |
| Ru4—Al25$^{iii}$ | 2.7401 (8) | Al15—Al22$^{i}$ | 2.8634 (11) |
| Ru4—Al25 | 2.7402 (8) | Al15—Al22$^{v}$ | 2.8818 (9) |
| Ru4—Al24 | 2.8446 (8) | Al15—Al22$^{iv}$ | 2.8818 (9) |
| Ru4—Al24$^{iii}$ | 2.8446 (8) | Al16—Al24 | 2.6216 (8) |
| Ru5—Al27 | 2.3207 (2) | Al16—Al24$^{iii}$ | 2.6216 (8) |
| Ru5—Al28C$^{i}$ | 2.35 (2) | Al16—Al21$^{x}$ | 2.9146 (11) |
| Ru5—Al28B$^{i}$ | 2.352 (16) | Al16—Al21$^{xi}$ | 2.9146 (11) |
| Ru5—Al28A$^{ii}$ | 2.5293 (18) | Al17A—Si17B | 0.63 (2) |
| Ru5—Al28A$^{i}$ | 2.5293 (18) | Al17A—Al28A$^{iii}$ | 2.581 (3) |
| Ru5—Al21 | 2.5429 (7) | Al17A—Al28A | 2.581 (3) |
| Ru5—Al21$^{iii}$ | 2.5429 (7) | Al17A—Al26A$^{v}$ | 2.588 (2) |

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|---|---|---|---|
| Ru5—Al23$^{iii}$ | 2.5708 (7) | Al17A—Al26A$^{iv}$ | 2.588 (2) |
| Ru5—Al23 | 2.5708 (7) | Al17A—Si26B$^{v}$ | 2.661 (3) |
| Ru5—Al22 | 2.5988 (7) | Al17A—Si26B$^{iv}$ | 2.661 (3) |
| Si6—Al26A$^{x}$ | 2.583 (5) | Al17A—Al18$^{vii}$ | 2.7577 (18) |
| Si6—Al26A$^{xi}$ | 2.583 (5) | Al17A—Al18$^{iv}$ | 2.7577 (18) |
| Si6—Al21$^{x}$ | 2.5898 (8) | Si17B—Al28A$^{iii}$ | 1.98 (2) |
| Si6—Al21$^{xi}$ | 2.5898 (8) | Si17B—Al28A | 1.98 (2) |
| Si6—Al14$^{xii}$ | 2.6404 (12) | Si17B—Al28B | 2.75 (4) |
| Si6—Al23$^{xi}$ | 2.7613 (9) | Si17B—Al25$^{iv}$ | 2.808 (7) |
| Si6—Al23$^{x}$ | 2.7613 (9) | Si17B—Al25$^{v}$ | 2.808 (7) |
| Si6—Al15$^{xiii}$ | 2.7990 (12) | Si18—Al19 | 2.6026 (14) |
| Si6—Al22$^{xi}$ | 2.8073 (9) | Si18—Al25 | 2.8305 (10) |
| Si6—Al22$^{x}$ | 2.8073 (9) | Si18—Al25$^{i}$ | 2.8305 (9) |
| Si6—Al16 | 2.9037 (15) | Si18—Al20 | 2.837 (2) |
| Ru7A—Al21 | 2.460 (3) | Al19—Al25$^{i}$ | 2.7344 (10) |
| Ru7A—Al21$^{i}$ | 2.460 (3) | Al19—Al25 | 2.7344 (10) |
| Ru7A—Si10 | 2.465 (2) | Al19—Al24 | 2.8599 (9) |
| Ru7A—Al16$^{xiv}$ | 2.486 (3) | Al19—Al24$^{i}$ | 2.8599 (9) |
| Ru7A—Al16$^{xv}$ | 2.486 (3) | Al20—Al20$^{ii}$ | 1.696 (4) |
| Ru7A—Al11$^{xv}$ | 2.5774 (16) | Al20—Si26B$^{i}$ | 2.127 (7) |
| Ru7A—Al19$^{xvi}$ | 2.586 (4) | Al20—Si26B | 2.127 (7) |
| Ru7A—Al12B | 2.74 (2) | Al20—Al26A | 2.616 (6) |
| Ru7A—Al12A | 2.832 (5) | Al20—Al26A$^{i}$ | 2.616 (6) |
| Ru7A—Al24$^{xvii}$ | 2.9086 (11) | Al21—Al26A | 2.6828 (18) |
| Ru7B—Al16$^{xiv}$ | 2.355 (14) | Al21—Al24$^{xvii}$ | 2.6980 (10) |
| Ru7B—Al16$^{xv}$ | 2.355 (14) | Al21—Si26B | 2.822 (3) |
| Ru7B—Al19$^{xvi}$ | 2.440 (18) | Al21—Al22 | 2.8362 (10) |
| Ru7B—Si10 | 2.543 (13) | Al22—Al28A$^{i}$ | 2.637 (2) |
| Ru7B—Al21 | 2.583 (15) | Al22—Al26A | 2.791 (4) |
| Ru7B—Al21$^{i}$ | 2.583 (15) | Al22—Al22$^{iii}$ | 2.8673 (15) |
| Ru7B—Al11$^{xv}$ | 2.604 (11) | Al23—Al24$^{xvii}$ | 2.6935 (10) |
| Ru7B—Al24$^{xvii}$ | 2.890 (6) | Al23—Al27 | 2.7939 (7) |
| Ru7B—Al24$^{xvi}$ | 2.890 (6) | Al23—Al23$^{xix}$ | 2.8174 (15) |
| Ru7B—Ru7B$^{xviii}$ | 2.93 (4) | Al23—Al23$^{xxiii}$ | 2.8534 (13) |
| Ru8—Ru8$^{xviii}$ | 0.384 (4) | Al23—Al28C$^{i}$ | 2.868 (13) |
| Ru8—Si26B$^{i}$ | 2.191 (4) | Al24—Al28C$^{xx}$ | 2.48 (2) |
| Ru8—Si26B | 2.191 (4) | Al24—Al28B$^{xx}$ | 2.670 (16) |
| Ru8—Si18 | 2.4257 (13) | Al24—Al25 | 2.7467 (10) |
| Ru8—Al26A | 2.428 (3) | Al24—Al24$^{xix}$ | 2.7858 (15) |
| Ru8—Al26A$^{i}$ | 2.428 (3) | Al25—Al28A$^{xx}$ | 2.592 (2) |
| Ru8—Si26B$^{xviii}$ | 2.455 (3) | Al26A—Si26B | 0.503 (2) |
| Ru8—Si26B$^{xix}$ | 2.455 (3) | Al26A—Al26A$^{xix}$ | 2.741 (6) |
| Ru8—Al11$^{xv}$ | 2.5478 (14) | Al27—Al28C$^{i}$ | 1.40 (3) |
| Ru8—Al18$^{xviii}$ | 2.6254 (15) | Al27—Al28C$^{xxiv}$ | 1.40 (3) |
| Ru8—Al26A$^{xviii}$ | 2.636 (3) | Al27—Al28B$^{i}$ | 1.98 (3) |
| Ru9—Si13 | 2.4102 (7) | Al27—Al28B$^{xxiv}$ | 1.98 (3) |
| Ru9—Al22$^{ix}$ | 2.5287 (7) | Al27—Al28A$^{i}$ | 2.8403 (19) |
| Ru9—Al14 | 2.5320 (7) | Al27—Al28A$^{xxiv}$ | 2.8403 (19) |

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|---|---|---|---|
| Ru9—Al26A | 2.5415 (17) | Al28A—Al28A$^{iii}$ | 0.754 (5) |
| Ru9—Al15$^{xx}$ | 2.5526 (5) | Al28A—Al28B | 0.98 (2) |
| Ru9—Al15$^{i}$ | 2.6130 (8) | Al28A—Al28C | 1.57 (4) |
| Ru9—Al22 | 2.6343 (7) | Al28B—Al28C | 0.63 (2) |
| Ru9—Si17B$^{xx}$ | 2.662 (6) | Al28C—Al28C$^{vi}$ | 2.79 (7) |

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| Si13—Ru1—Si13$^{i}$ | 109.88 (4) | Ru3—Al17A—Al28A$^{iii}$ | 60.70 (6) |
| Si13—Ru1—Si18 | 85.009 (14) | Si17B—Al17A—Al28A | 16.0 (9) |
| Si13$^{i}$—Ru1—Si18 | 85.008 (14) | Ru3—Al17A—Al28A | 60.69 (6) |
| Si13—Ru1—Al18$^{ii}$ | 85.008 (14) | Al28A$^{iii}$—Al17A—Al28A | 16.81 (11) |
| Si13$^{i}$—Ru1—Al18$^{ii}$ | 85.008 (14) | Si17B—Al17A—Al26A$^{v}$ | 125.3 (8) |
| Si18—Ru1—Al18$^{ii}$ | 162.57 (5) | Ru3—Al17A—Al26A$^{v}$ | 139.14 (13) |
| Si13—Ru1—Al19 | 117.000 (18) | Al28A$^{iii}$—Al17A—Al26A$^{v}$ | 141.06 (11) |
| Si13$^{i}$—Ru1—Al19 | 117.001 (18) | Al28A—Al17A—Al26A$^{v}$ | 128.54 (8) |
| Si18—Ru1—Al19 | 60.93 (3) | Si17B—Al17A—Al26A$^{iv}$ | 125.3 (8) |
| Al18$^{ii}$—Ru1—Al19 | 136.49 (4) | Ru3—Al17A—Al26A$^{iv}$ | 139.14 (13) |
| Si13—Ru1—Al19$^{ii}$ | 117.000 (18) | Al28A$^{iii}$—Al17A—Al26A$^{iv}$ | 128.53 (8) |
| Si13$^{i}$—Ru1—Al19$^{ii}$ | 117.001 (18) | Al28A—Al17A—Al26A$^{iv}$ | 141.06 (11) |
| Si18—Ru1—Al19$^{ii}$ | 136.49 (4) | Al26A$^{v}$—Al17A—Al26A$^{iv}$ | 63.95 (14) |
| Al18$^{ii}$—Ru1—Al19$^{ii}$ | 60.93 (3) | Si17B—Al17A—Si26B$^{v}$ | 130.6 (7) |
| Al19—Ru1—Al19$^{ii}$ | 75.56 (5) | Ru3—Al17A—Si26B$^{v}$ | 128.58 (15) |
| Si13—Ru1—Al20$^{ii}$ | 56.78 (2) | Al28A$^{iii}$—Al17A—Si26B$^{v}$ | 145.29 (10) |
| Si13$^{i}$—Ru1—Al20$^{ii}$ | 56.78 (2) | Al28A—Al17A—Si26B$^{v}$ | 130.25 (9) |
| Si18—Ru1—Al20$^{ii}$ | 98.78 (5) | Al26A$^{v}$—Al17A—Si26B$^{v}$ | 10.89 (5) |
| Al18$^{ii}$—Ru1—Al20$^{ii}$ | 63.79 (5) | Al26A$^{iv}$—Al17A—Si26B$^{v}$ | 69.85 (14) |
| Al19—Ru1—Al20$^{ii}$ | 159.71 (5) | Si17B—Al17A—Si26B$^{iv}$ | 130.6 (7) |
| Al19$^{ii}$—Ru1—Al20$^{ii}$ | 124.73 (5) | Ru3—Al17A—Si26B$^{iv}$ | 128.58 (15) |
| Si13—Ru1—Al20 | 56.78 (2) | Al28A$^{iii}$—Al17A—Si26B$^{iv}$ | 130.25 (9) |
| Si13$^{i}$—Ru1—Al20 | 56.78 (2) | Al28A—Al17A—Si26B$^{iv}$ | 145.29 (10) |
| Si18—Ru1—Al20 | 63.80 (5) | Al26A$^{v}$—Al17A—Si26B$^{iv}$ | 69.85 (14) |
| Al18$^{ii}$—Ru1—Al20 | 98.78 (5) | Al26A$^{iv}$—Al17A—Si26B$^{iv}$ | 10.89 (5) |
| Al19—Ru1—Al20 | 124.73 (5) | Si26B$^{v}$—Al17A—Si26B$^{iv}$ | 74.02 (16) |
| Al19$^{ii}$—Ru1—Al20 | 159.71 (5) | Si17B—Al17A—Al15 | 70.5 (11) |
| Al20$^{ii}$—Ru1—Al20 | 34.98 (9) | Ru3—Al17A—Al15 | 144.49 (11) |
| Si13—Ru1—Al25 | 57.77 (2) | Al28A$^{iii}$—Al17A—Al15 | 84.21 (8) |
| Si13$^{i}$—Ru1—Al25 | 145.35 (2) | Al28A—Al17A—Al15 | 84.21 (8) |
| Si18—Ru1—Al25 | 62.825 (19) | Al26A$^{v}$—Al17A—Al15 | 66.88 (12) |
| Al18$^{ii}$—Ru1—Al25 | 122.209 (17) | Al26A$^{iv}$—Al17A—Al15 | 66.88 (12) |
| Al19—Ru1—Al25 | 59.618 (17) | Si26B$^{v}$—Al17A—Al15 | 77.42 (14) |
| Al19$^{ii}$—Ru1—Al25 | 96.18 (2) | Si26B$^{iv}$—Al17A—Al15 | 77.42 (14) |
| Al20$^{ii}$—Ru1—Al25 | 113.00 (3) | Si17B—Al17A—Al18$^{vii}$ | 123.8 (9) |
| Al20—Ru1—Al25 | 95.15 (3) | Ru3—Al17A—Al18$^{vii}$ | 59.97 (3) |
| Si13—Ru1—Al25$^{i}$ | 145.35 (2) | Al28A$^{iii}$—Al17A—Al18$^{vii}$ | 116.49 (7) |
| Si13$^{i}$—Ru1—Al25$^{i}$ | 57.78 (2) | Al28A—Al17A—Al18$^{vii}$ | 107.86 (6) |
| Si18—Ru1—Al25$^{i}$ | 62.825 (19) | Al26A$^{v}$—Al17A—Al18$^{vii}$ | 81.29 (14) |
| Al18$^{ii}$—Ru1—Al25$^{i}$ | 122.210 (17) | Al26A$^{iv}$—Al17A—Al18$^{vii}$ | 110.69 (12) |
| Al19—Ru1—Al25$^{i}$ | 59.616 (17) | Si26B$^{v}$—Al17A—Al18$^{vii}$ | 70.40 (15) |
| Al19$^{ii}$—Ru1—Al25$^{i}$ | 96.18 (2) | Si26B$^{iv}$—Al17A—Al18$^{vii}$ | 103.80 (13) |

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| Al20$^{ii}$—Ru1—Al25$^{i}$ | 113.00 (3) | Al15—Al17A—Al18$^{vii}$ | 145.81 (5) |
| Al20—Ru1—Al25$^{i}$ | 95.15 (3) | Si17B—Al17A—Al18$^{iv}$ | 123.8 (9) |
| Al25—Ru1—Al25$^{i}$ | 111.83 (3) | Ru3—Al17A—Al18$^{iv}$ | 59.97 (3) |
| Si13—Ru1—Al25$^{iii}$ | 57.77 (2) | Al28A$^{iii}$—Al17A—Al18$^{iv}$ | 107.86 (6) |
| Si13$^{i}$—Ru1—Al25$^{iii}$ | 145.35 (2) | Al28A—Al17A—Al18$^{iv}$ | 116.49 (7) |
| Si18—Ru1—Al25$^{iii}$ | 122.210 (17) | Al26A$^{v}$—Al17A—Al18$^{iv}$ | 110.69 (12) |
| Al18$^{ii}$—Ru1—Al25$^{iii}$ | 62.825 (19) | Al26A$^{iv}$—Al17A—Al18$^{iv}$ | 81.29 (14) |
| Al19—Ru1—Al25$^{iii}$ | 96.18 (2) | Si26B$^{v}$—Al17A—Al18$^{iv}$ | 103.80 (13) |
| Al19$^{ii}$—Ru1—Al25$^{iii}$ | 59.616 (17) | Si26B$^{iv}$—Al17A—Al18$^{iv}$ | 70.40 (15) |
| Al20$^{ii}$—Ru1—Al25$^{iii}$ | 95.15 (3) | Al15—Al17A—Al18$^{iv}$ | 145.81 (5) |
| Al20—Ru1—Al25$^{iii}$ | 113.00 (3) | Al18$^{vii}$—Al17A—Al18$^{iv}$ | 56.93 (5) |
| Al25—Ru1—Al25$^{iii}$ | 60.08 (3) | Si17B—Al17A—Ru8$^{vii}$ | 175.5 (5) |
| Al25$^{i}$—Ru1—Al25$^{iii}$ | 150.82 (3) | Ru3—Al17A—Ru8$^{vii}$ | 103.83 (6) |
| Si26B—Ru2—Si26B$^{iii}$ | 131.1 (3) | Al28A$^{iii}$—Al17A—Ru8$^{vii}$ | 163.69 (7) |
| Si26B—Ru2—Si13 | 69.75 (9) | Al28A—Al17A—Ru8$^{vii}$ | 159.96 (7) |
| Si26B$^{iii}$—Ru2—Si13 | 69.75 (9) | Al26A$^{v}$—Al17A—Ru8$^{vii}$ | 53.88 (9) |
| Si26B—Ru2—Al12B | 71.4 (7) | Al26A$^{iv}$—Al17A—Ru8$^{vii}$ | 58.94 (9) |
| Si26B$^{iii}$—Ru2—Al12B | 96.7 (5) | Si26B$^{v}$—Al17A—Ru8$^{vii}$ | 47.63 (10) |
| Si13—Ru2—Al12B | 108.2 (5) | Si26B$^{iv}$—Al17A—Ru8$^{vii}$ | 53.82 (9) |
| Si26B—Ru2—Al12B$^{ii}$ | 96.7 (5) | Al15—Al17A—Ru8$^{vii}$ | 111.59 (6) |
| Si26B$^{iii}$—Ru2—Al12B$^{ii}$ | 71.4 (7) | Al18$^{vii}$—Al17A—Ru8$^{vii}$ | 52.15 (5) |
| Si13—Ru2—Al12B$^{ii}$ | 108.2 (5) | Al18$^{iv}$—Al17A—Ru8$^{vii}$ | 56.82 (6) |
| Al12B—Ru2—Al12B$^{ii}$ | 27.6 (12) | Al17A—Si17B—Al28A$^{iii}$ | 159.0 (12) |
| Si26B—Ru2—Al21$^{iii}$ | 143.17 (6) | Al17A—Si17B—Al28A | 159.0 (12) |
| Si26B$^{iii}$—Ru2—Al21$^{iii}$ | 69.49 (9) | Al28A$^{iii}$—Si17B—Al28A | 21.9 (3) |
| Si13—Ru2—Al21$^{iii}$ | 139.236 (17) | Al17A—Si17B—Ru3 | 91.8 (12) |
| Al12B—Ru2—Al21$^{iii}$ | 76.4 (6) | Al28A$^{iii}$—Si17B—Ru3 | 70.5 (5) |
| Al12B$^{ii}$—Ru2—Al21$^{iii}$ | 57.5 (4) | Al28A—Si17B—Ru3 | 70.5 (5) |
| Si26B—Ru2—Al21 | 69.49 (9) | Al17A—Si17B—Al15 | 96.0 (12) |
| Si26B$^{iii}$—Ru2—Al21 | 143.17 (6) | Al28A$^{iii}$—Si17B—Al15 | 101.8 (8) |
| Si13—Ru2—Al21 | 139.237 (17) | Al28A—Si17B—Al15 | 101.8 (8) |
| Al12B—Ru2—Al21 | 57.5 (4) | Ru3—Si17B—Al15 | 172.2 (12) |
| Al12B$^{ii}$—Ru2—Al21 | 76.4 (6) | Al17A—Si17B—Ru9$^{iv}$ | 95.2 (8) |
| Al21$^{iii}$—Ru2—Al21 | 78.42 (3) | Al28A$^{iii}$—Si17B—Ru9$^{iv}$ | 84.8 (5) |
| Si26B—Ru2—Al26A$^{iii}$ | 141.3 (2) | Al28A—Si17B—Ru9$^{iv}$ | 103.5 (8) |
| Si26B$^{iii}$—Ru2—Al26A$^{iii}$ | 11.46 (6) | Ru3—Si17B—Ru9$^{iv}$ | 120.6 (2) |
| Si13—Ru2—Al26A$^{iii}$ | 75.71 (7) | Al15—Si17B—Ru9$^{iv}$ | 58.7 (2) |
| Al12B—Ru2—Al26A$^{iii}$ | 104.4 (5) | Al17A—Si17B—Ru9$^{v}$ | 95.2 (8) |
| Al12B$^{ii}$—Ru2—Al26A$^{iii}$ | 77.8 (6) | Al28A$^{iii}$—Si17B—Ru9$^{v}$ | 103.5 (8) |
| Al21$^{iii}$—Ru2—Al26A$^{iii}$ | 64.24 (6) | Al28A—Si17B—Ru9$^{v}$ | 84.8 (5) |
| Al21—Ru2—Al26A$^{iii}$ | 141.99 (5) | Ru3—Si17B—Ru9$^{v}$ | 120.6 (2) |
| Si26B—Ru2—Al26A | 11.46 (6) | Al15—Si17B—Ru9$^{v}$ | 58.7 (2) |
| Si26B$^{iii}$—Ru2—Al26A | 141.3 (2) | Ru9$^{iv}$—Si17B—Ru9$^{v}$ | 117.3 (4) |
| Si13—Ru2—Al26A | 75.70 (7) | Al17A—Si17B—Al28B | 151.9 (13) |
| Al12B—Ru2—Al26A | 77.8 (6) | Al28A$^{iii}$—Si17B—Al28B | 14.9 (3) |
| Al12B$^{ii}$—Ru2—Al26A | 104.4 (5) | Al28A—Si17B—Al28B | 14.9 (3) |
| Al21$^{iii}$—Ru2—Al26A | 141.99 (4) | Ru3—Si17B—Al28B | 60.1 (5) |
| Al21—Ru2—Al26A | 64.24 (6) | Al15—Si17B—Al28B | 112.1 (9) |

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| Al26A$^{iii}$—Ru2—Al26A | 150.45 (19) | Ru9$^{iv}$—Si17B—Al28B | 99.3 (7) |
| Si26B—Ru2—Al22 | 76.76 (16) | Ru9$^{v}$—Si17B—Al28B | 99.3 (7) |
| Si26B$^{iii}$—Ru2—Al22 | 139.60 (14) | Al17A—Si17B—Al25$^{iv}$ | 98.7 (8) |
| Si13—Ru2—Al22 | 103.99 (2) | Al28A$^{iii}$—Si17B—Al25$^{iv}$ | 62.7 (3) |
| Al12B—Ru2—Al22 | 122.3 (4) | Al28A—Si17B—Al25$^{iv}$ | 82.1 (6) |
| Al12B$^{ii}$—Ru2—Al22 | 142.5 (6) | Ru3—Si17B—Al25$^{iv}$ | 58.8 (2) |
| Al21$^{iii}$—Ru2—Al22 | 106.99 (2) | Al15—Si17B—Al25$^{iv}$ | 119.7 (3) |
| Al21—Ru2—Al22 | 66.69 (2) | Ru9$^{iv}$—Si17B—Al25$^{iv}$ | 61.84 (8) |
| Al26A$^{iii}$—Ru2—Al22 | 129.56 (11) | Ru9$^{v}$—Si17B—Al25$^{iv}$ | 166.1 (11) |
| Al26A—Ru2—Al22 | 65.46 (12) | Al28B—Si17B—Al25$^{iv}$ | 67.9 (4) |
| Si17B—Ru3—Al24$^{iv}$ | 115.9 (5) | Al17A—Si17B—Al25$^{v}$ | 98.7 (8) |
| Si17B—Ru3—Al24$^{v}$ | 115.9 (5) | Al28A$^{iii}$—Si17B—Al25$^{v}$ | 82.1 (6) |
| Al24$^{iv}$—Ru3—Al24$^{v}$ | 66.35 (3) | Al28A—Si17B—Al25$^{v}$ | 62.7 (3) |
| Si17B—Ru3—Al17A | 14.2 (6) | Ru3—Si17B—Al25$^{v}$ | 58.8 (2) |
| Al24$^{iv}$—Ru3—Al17A | 126.73 (5) | Al15—Si17B—Al25$^{v}$ | 119.7 (3) |
| Al24$^{v}$—Ru3—Al17A | 126.73 (5) | Ru9$^{iv}$—Si17B—Al25$^{v}$ | 166.1 (11) |
| Si17B—Ru3—Al28A$^{iii}$ | 46.0 (6) | Ru9$^{v}$—Si17B—Al25$^{v}$ | 61.84 (8) |
| Al24$^{iv}$—Ru3—Al28A$^{iii}$ | 73.78 (5) | Al28B—Si17B—Al25$^{v}$ | 67.9 (4) |
| Al24$^{v}$—Ru3—Al28A$^{iii}$ | 83.07 (5) | Al25$^{iv}$—Si17B—Al25$^{v}$ | 115.3 (5) |
| Al17A—Ru3—Al28A$^{iii}$ | 59.93 (7) | Ru8—Si18—Ru1 | 126.28 (6) |
| Si17B—Ru3—Al28A | 46.0 (6) | Ru8—Si18—Al19 | 172.67 (7) |
| Al24$^{iv}$—Ru3—Al28A | 83.07 (5) | Ru1—Si18—Al19 | 61.05 (3) |
| Al24$^{v}$—Ru3—Al28A | 73.78 (5) | Ru8—Si18—Ru8$^{xviii}$ | 7.45 (7) |
| Al17A—Ru3—Al28A | 59.93 (7) | Ru1—Si18—Ru8$^{xviii}$ | 133.73 (6) |
| Al28A$^{iii}$—Ru3—Al28A | 16.68 (11) | Al19—Si18—Ru8$^{xviii}$ | 165.22 (6) |
| Si17B—Ru3—Al25$^{iv}$ | 67.11 (10) | Ru8—Si18—Al18$^{xviii}$ | 62.43 (5) |
| Al24$^{iv}$—Ru3—Al25$^{iv}$ | 64.41 (2) | Ru1—Si18—Al18$^{xviii}$ | 171.29 (2) |
| Al24$^{v}$—Ru3—Al25$^{iv}$ | 124.31 (3) | Al19—Si18—Al18$^{xviii}$ | 110.24 (3) |
| Al17A—Ru3—Al25$^{iv}$ | 70.03 (2) | Ru8$^{xviii}$—Si18—Al18$^{xviii}$ | 54.99 (4) |
| Al28A$^{iii}$—Ru3—Al25$^{iv}$ | 59.69 (6) | Ru8—Si18—Ru3$^{vii}$ | 110.84 (5) |
| Al28A—Ru3—Al25$^{iv}$ | 76.07 (6) | Ru1—Si18—Ru3$^{vii}$ | 112.80 (3) |
| Si17B—Ru3—Al25$^{v}$ | 67.11 (10) | Al19—Si18—Ru3$^{vii}$ | 63.41 (3) |
| Al24$^{iv}$—Ru3—Al25$^{v}$ | 124.31 (3) | Ru8$^{xviii}$—Si18—Ru3$^{vii}$ | 104.87 (4) |
| Al24$^{v}$—Ru3—Al25$^{v}$ | 64.41 (2) | Al18$^{xviii}$—Si18—Ru3$^{vii}$ | 60.46 (2) |
| Al17A—Ru3—Al25$^{v}$ | 70.03 (2) | Ru8—Si18—Ru3$^{xx}$ | 110.84 (5) |
| Al28A$^{iii}$—Ru3—Al25$^{v}$ | 76.07 (6) | Ru1—Si18—Ru3$^{xx}$ | 112.80 (3) |
| Al28A—Ru3—Al25$^{v}$ | 59.69 (6) | Al19—Si18—Ru3$^{xx}$ | 63.41 (3) |
| Al25$^{iv}$—Ru3—Al25$^{v}$ | 130.93 (4) | Ru8$^{xviii}$—Si18—Ru3$^{xx}$ | 104.87 (4) |
| Si17B—Ru3—Si10$^{vi}$ | 177.3 (6) | Al18$^{xviii}$—Si18—Ru3$^{xx}$ | 60.46 (2) |
| Al24$^{iv}$—Ru3—Si10$^{vi}$ | 66.27 (2) | Ru3$^{vii}$—Si18—Ru3$^{xx}$ | 69.26 (3) |
| Al24$^{v}$—Ru3—Si10$^{vi}$ | 66.27 (2) | Ru8—Si18—Al17A$^{vii}$ | 63.98 (5) |
| Al17A—Ru3—Si10$^{vi}$ | 163.13 (6) | Ru1—Si18—Al17A$^{vii}$ | 120.56 (3) |
| Al28A$^{iii}$—Ru3—Si10$^{vi}$ | 136.65 (5) | Al19—Si18—Al17A$^{vii}$ | 113.31 (5) |
| Al28A—Ru3—Si10$^{vi}$ | 136.64 (5) | Ru8$^{xviii}$—Si18—Al17A$^{vii}$ | 61.64 (5) |
| Al25$^{iv}$—Ru3—Si10$^{vi}$ | 113.29 (2) | Al18$^{xviii}$—Si18—Al17A$^{vii}$ | 61.53 (3) |
| Al25$^{v}$—Ru3—Si10$^{vi}$ | 113.29 (2) | Ru3$^{vii}$—Si18—Al17A$^{vii}$ | 56.46 (4) |
| Si17B—Ru3—Al28B | 65.3 (8) | Ru3$^{xx}$—Si18—Al17A$^{vii}$ | 114.00 (4) |
| Al24$^{iv}$—Ru3—Al28B | 62.2 (5) | Ru8—Si18—Al17A$^{xx}$ | 63.98 (5) |

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| Al24$^{v}$—Ru3—Al28B | 62.2 (5) | Ru1—Si18—Al17A$^{xx}$ | 120.56 (3) |
| Al17A—Ru3—Al28B | 79.5 (6) | Al19—Si18—Al17A$^{xx}$ | 113.31 (5) |
| Al28A$^{iii}$—Ru3—Al28B | 21.5 (5) | Ru8$^{xviii}$—Si18—Al17A$^{xx}$ | 61.64 (5) |
| Al28A—Ru3—Al28B | 21.5 (5) | Al18$^{xviii}$—Si18—Al17A$^{xx}$ | 61.53 (3) |
| Al25$^{iv}$—Ru3—Al28B | 72.86 (18) | Ru3$^{vii}$—Si18—Al17A$^{xx}$ | 114.00 (4) |
| Al25$^{v}$—Ru3—Al28B | 72.86 (18) | Ru3$^{xx}$—Si18—Al17A$^{xx}$ | 56.46 (4) |
| Si10$^{vi}$—Ru3—Al28B | 117.4 (6) | Al17A$^{vii}$—Si18—Al17A$^{xx}$ | 115.12 (8) |
| Si17B—Ru3—Al18$^{vii}$ | 75.6 (5) | Ru8—Si18—Al25 | 121.29 (3) |
| Al24$^{iv}$—Ru3—Al18$^{vii}$ | 166.84 (2) | Ru1—Si18—Al25 | 64.64 (3) |
| Al24$^{v}$—Ru3—Al18$^{vii}$ | 115.73 (3) | Al19—Si18—Al25 | 60.26 (3) |
| Al17A—Ru3—Al18$^{vii}$ | 63.57 (5) | Ru8$^{xviii}$—Si18—Al25 | 122.31 (3) |
| Al28A$^{iii}$—Ru3—Al18$^{vii}$ | 119.09 (5) | Al18$^{xviii}$—Si18—Al25 | 111.93 (3) |
| Al28A—Ru3—Al18$^{vii}$ | 110.08 (5) | Ru3$^{vii}$—Si18—Al25 | 113.87 (4) |
| Al25$^{iv}$—Ru3—Al18$^{vii}$ | 118.23 (3) | Ru3$^{xx}$—Si18—Al25 | 56.53 (2) |
| Al25$^{v}$—Ru3—Al18$^{vii}$ | 64.92 (3) | Al17A$^{vii}$—Si18—Al25 | 169.79 (5) |
| Si10$^{vi}$—Ru3—Al18$^{vii}$ | 102.06 (2) | Al17A$^{xx}$—Si18—Al25 | 64.16 (5) |
| Al28B—Ru3—Al18$^{vii}$ | 130.8 (4) | Ru8—Si18—Al25$^{i}$ | 121.29 (3) |
| Si17B—Ru3—Al18$^{iv}$ | 75.6 (5) | Ru1—Si18—Al25$^{i}$ | 64.64 (3) |
| Al24$^{iv}$—Ru3—Al18$^{iv}$ | 115.73 (3) | Al19—Si18—Al25$^{i}$ | 60.26 (3) |
| Al24$^{v}$—Ru3—Al18$^{iv}$ | 166.84 (2) | Ru8$^{xviii}$—Si18—Al25$^{i}$ | 122.31 (3) |
| Al17A—Ru3—Al18$^{iv}$ | 63.57 (5) | Al18$^{xviii}$—Si18—Al25$^{i}$ | 111.93 (3) |
| Al28A$^{iii}$—Ru3—Al18$^{iv}$ | 110.07 (5) | Ru3$^{vii}$—Si18—Al25$^{i}$ | 56.53 (2) |
| Al28A—Ru3—Al18$^{iv}$ | 119.09 (5) | Ru3$^{xx}$—Si18—Al25$^{i}$ | 113.86 (4) |
| Al25$^{iv}$—Ru3—Al18$^{iv}$ | 64.92 (3) | Al17A$^{vii}$—Si18—Al25$^{i}$ | 64.17 (5) |
| Al25$^{v}$—Ru3—Al18$^{iv}$ | 118.23 (3) | Al17A$^{xx}$—Si18—Al25$^{i}$ | 169.79 (5) |
| Si10$^{vi}$—Ru3—Al18$^{iv}$ | 102.06 (2) | Al25—Si18—Al25$^{i}$ | 114.54 (5) |
| Al28B—Ru3—Al18$^{iv}$ | 130.8 (4) | Ru8—Si18—Al20 | 63.09 (6) |
| Al18$^{vii}$—Ru3—Al18$^{iv}$ | 59.08 (4) | Ru1—Si18—Al20 | 63.19 (5) |
| Al16—Ru4—Al23$^{viii}$ | 139.23 (2) | Al19—Si18—Al20 | 124.24 (6) |
| Al16—Ru4—Al23$^{ix}$ | 139.23 (2) | Ru8$^{xviii}$—Si18—Al20 | 70.54 (6) |
| Al23$^{viii}$—Ru4—Al23$^{ix}$ | 67.76 (3) | Al18$^{xviii}$—Si18—Al20 | 125.52 (5) |
| Al16—Ru4—Al14 | 144.31 (4) | Ru3$^{vii}$—Si18—Al20 | 145.349 (14) |
| Al23$^{viii}$—Ru4—Al14 | 65.38 (2) | Ru3$^{xx}$—Si18—Al20 | 145.349 (14) |
| Al23$^{ix}$—Ru4—Al14 | 65.38 (2) | Al17A$^{vii}$—Si18—Al20 | 94.40 (4) |
| Al16—Ru4—Al23$^{x}$ | 75.80 (3) | Al17A$^{xx}$—Si18—Al20 | 94.40 (4) |
| Al23$^{viii}$—Ru4—Al23$^{x}$ | 102.12 (2) | Al25—Si18—Al20 | 95.81 (4) |
| Al23$^{ix}$—Ru4—Al23$^{x}$ | 67.19 (3) | Al25$^{i}$—Si18—Al20 | 95.81 (4) |
| Al14—Ru4—Al23$^{x}$ | 132.11 (2) | Ru7B$^{xxv}$—Al19—Ru7A$^{xxv}$ | 3.6 (4) |
| Al16—Ru4—Al23$^{xi}$ | 75.80 (3) | Ru7B$^{xxv}$—Al19—Si18 | 162.8 (5) |
| Al23$^{viii}$—Ru4—Al23$^{xi}$ | 67.19 (3) | Ru7A$^{xxv}$—Al19—Si18 | 159.20 (10) |
| Al23$^{ix}$—Ru4—Al23$^{xi}$ | 102.12 (2) | Ru7B$^{xxv}$—Al19—Ru1 | 139.2 (5) |
| Al14—Ru4—Al23$^{xi}$ | 132.11 (2) | Ru7A$^{xxv}$—Al19—Ru1 | 142.79 (9) |
| Al23$^{x}$—Ru4—Al23$^{xi}$ | 64.83 (3) | Si18—Al19—Ru1 | 58.02 (3) |
| Al16—Ru4—Al25$^{iii}$ | 89.86 (3) | Ru7B$^{xxv}$—Al19—Si10$^{xxvii}$ | 59.8 (5) |
| Al23$^{viii}$—Ru4—Al25$^{iii}$ | 89.91 (3) | Ru7A$^{xxv}$—Al19—Si10$^{xxvii}$ | 56.17 (9) |
| Al23$^{ix}$—Ru4—Al25$^{iii}$ | 125.74 (2) | Si18—Al19—Si10$^{xxvii}$ | 103.03 (5) |
| Al14—Ru4—Al25$^{iii}$ | 60.36 (2) | Ru1—Al19—Si10$^{xxvii}$ | 161.04 (5) |
| Al23$^{x}$—Ru4—Al25$^{iii}$ | 165.54 (3) | Ru7B$^{xxv}$—Al19—Al25$^{i}$ | 118.98 (5) |

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| Al23$^{xi}$—Ru4—Al25$^{iii}$ | 113.90 (2) | Ru7A$^{xxv}$—Al19—Al25$^{i}$ | 119.26 (2) |
| Al16—Ru4—Al25 | 89.86 (3) | Si18—Al19—Al25$^{i}$ | 64.00 (3) |
| Al23$^{viii}$—Ru4—Al25 | 125.74 (2) | Ru1—Al19—Al25$^{i}$ | 65.10 (3) |
| Al23$^{ix}$—Ru4—Al25 | 89.91 (3) | Si10$^{xxvii}$—Al19—Al25$^{i}$ | 108.41 (3) |
| Al14—Ru4—Al25 | 60.36 (2) | Ru7B$^{xxv}$—Al19—Al25 | 118.98 (5) |
| Al23$^{x}$—Ru4—Al25 | 113.90 (2) | Ru7A$^{xxv}$—Al19—Al25 | 119.26 (2) |
| Al23$^{xi}$—Ru4—Al25 | 165.54 (3) | Si18—Al19—Al25 | 64.00 (3) |
| Al25$^{iii}$—Ru4—Al25 | 63.37 (4) | Ru1—Al19—Al25 | 65.10 (3) |
| Al16—Ru4—Al24 | 58.633 (16) | Si10$^{xxvii}$—Al19—Al25 | 108.41 (3) |
| Al23$^{viii}$—Ru4—Al24 | 153.59 (2) | Al25$^{i}$—Al19—Al25 | 121.10 (5) |
| Al23$^{ix}$—Ru4—Al24 | 87.02 (2) | Ru7B$^{xxv}$—Al19—Ru3$^{vii}$ | 106.9 (4) |
| Al14—Ru4—Al24 | 112.050 (17) | Ru7A$^{xxv}$—Al19—Ru3$^{vii}$ | 103.87 (7) |
| Al23$^{x}$—Ru4—Al24 | 58.81 (2) | Si18—Al19—Ru3$^{vii}$ | 59.41 (3) |
| Al23$^{xi}$—Ru4—Al24 | 113.17 (2) | Ru1—Al19—Ru3$^{vii}$ | 107.11 (3) |
| Al25$^{iii}$—Ru4—Al24 | 112.10 (3) | Si10$^{xxvii}$—Al19—Ru3$^{vii}$ | 57.80 (3) |
| Al25—Ru4—Al24 | 58.89 (2) | Al25$^{i}$—Al19—Ru3$^{vii}$ | 56.54 (2) |
| Al16—Ru4—Al24$^{iii}$ | 58.634 (16) | Al25—Al19—Ru3$^{vii}$ | 113.66 (4) |
| Al23$^{viii}$—Ru4—Al24$^{iii}$ | 87.02 (2) | Ru7B$^{xxv}$—Al19—Ru3$^{xx}$ | 106.9 (4) |
| Al23$^{ix}$—Ru4—Al24$^{iii}$ | 153.59 (2) | Ru7A$^{xxv}$—Al19—Ru3$^{xx}$ | 103.87 (7) |
| Al14—Ru4—Al24$^{iii}$ | 112.049 (17) | Si18—Al19—Ru3$^{xx}$ | 59.41 (3) |
| Al23$^{x}$—Ru4—Al24$^{iii}$ | 113.17 (2) | Ru1—Al19—Ru3$^{xx}$ | 107.11 (3) |
| Al23$^{xi}$—Ru4—Al24$^{iii}$ | 58.81 (2) | Si10$^{xxvii}$—Al19—Ru3$^{xx}$ | 57.80 (3) |
| Al25$^{iii}$—Ru4—Al24$^{iii}$ | 58.88 (2) | Al25$^{i}$—Al19—Ru3$^{xx}$ | 113.66 (4) |
| Al25—Ru4—Al24$^{iii}$ | 112.10 (3) | Al25—Al19—Ru3$^{xx}$ | 56.54 (2) |
| Al24—Ru4—Al24$^{iii}$ | 116.42 (3) | Ru3$^{vii}$—Al19—Ru3$^{xx}$ | 66.33 (3) |
| Al27—Ru5—Al28C$^{i}$ | 34.8 (9) | Ru7B$^{xxv}$—Al19—Al24 | 65.53 (15) |
| Al27—Ru5—Al28B$^{i}$ | 50.3 (7) | Ru7A$^{xxv}$—Al19—Al24 | 64.34 (3) |
| Al28C$^{i}$—Ru5—Al28B$^{i}$ | 15.5 (6) | Si18—Al19—Al24 | 107.72 (3) |
| Al27—Ru5—Al28A$^{ii}$ | 71.55 (4) | Ru1—Al19—Al24 | 121.07 (2) |
| Al28C$^{i}$—Ru5—Al28A$^{ii}$ | 37.4 (9) | Si10$^{xxvii}$—Al19—Al24 | 61.56 (2) |
| Al28B$^{i}$—Ru5—Al28A$^{ii}$ | 22.7 (6) | Al25$^{i}$—Al19—Al24 | 166.35 (5) |
| Al27—Ru5—Al28A$^{i}$ | 71.55 (4) | Al25—Al19—Al24 | 58.76 (2) |
| Al28C$^{i}$—Ru5—Al28A$^{i}$ | 37.4 (9) | Ru3$^{vii}$—Al19—Al24 | 110.17 (4) |
| Al28B$^{i}$—Ru5—Al28A$^{i}$ | 22.7 (6) | Ru3$^{xx}$—Al19—Al24 | 53.74 (2) |
| Al28A$^{ii}$—Ru5—Al28A$^{i}$ | 17.15 (11) | Ru7B$^{xxv}$—Al19—Al24$^{i}$ | 65.53 (15) |
| Al27—Ru5—Al21 | 127.171 (16) | Ru7A$^{xxv}$—Al19—Al24$^{i}$ | 64.34 (3) |
| Al28C$^{i}$—Ru5—Al21 | 140.96 (9) | Si18—Al19—Al24$^{i}$ | 107.71 (3) |
| Al28B$^{i}$—Ru5—Al21 | 139.85 (16) | Ru1—Al19—Al24$^{i}$ | 121.07 (2) |
| Al28A$^{ii}$—Ru5—Al21 | 138.19 (5) | Si10$^{xxvii}$—Al19—Al24$^{i}$ | 61.56 (2) |
| Al28A$^{i}$—Ru5—Al21 | 123.94 (6) | Al25$^{i}$—Al19—Al24$^{i}$ | 58.76 (2) |
| Al27—Ru5—Al21$^{iii}$ | 127.172 (16) | Al25—Al19—Al24$^{i}$ | 166.35 (5) |
| Al28C$^{i}$—Ru5—Al21$^{iii}$ | 140.96 (9) | Ru3$^{vii}$—Al19—Al24$^{i}$ | 53.74 (2) |
| Al28B$^{i}$—Ru5—Al21$^{iii}$ | 139.85 (16) | Ru3$^{xx}$—Al19—Al24$^{i}$ | 110.17 (4) |
| Al28A$^{ii}$—Ru5—Al21$^{iii}$ | 123.94 (6) | Al24—Al19—Al24$^{i}$ | 117.69 (4) |
| Al28A$^{i}$—Ru5—Al21$^{iii}$ | 138.19 (5) | Al20$^{ii}$—Al20—Si26B$^{i}$ | 129.78 (9) |
| Al21—Ru5—Al21$^{iii}$ | 77.66 (3) | Al20$^{ii}$—Al20—Si26B | 129.78 (9) |
| Al27—Ru5—Al23$^{iii}$ | 69.449 (16) | Si26B$^{i}$—Al20—Si26B | 97.04 (16) |
| Al28C$^{i}$—Ru5—Al23$^{iii}$ | 71.17 (14) | Al20$^{ii}$—Al20—Al12B | 83.4 (7) |

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| Al28B$^{i}$—Ru5—Al23$^{iii}$ | 74.28 (16) | Si26B$^{i}$—Al20—Al12B | 84.5 (4) |
| Al28A$^{ii}$—Ru5—Al23$^{iii}$ | 72.12 (6) | Si26B—Al20—Al12B | 84.5 (4) |
| Al28A$^{i}$—Ru5—Al23$^{iii}$ | 88.37 (6) | Al20$^{ii}$—Al20—Si13$^{i}$ | 70.32 (5) |
| Al21—Ru5—Al23$^{iii}$ | 145.86 (2) | Si26B$^{i}$—Al20—Si13$^{i}$ | 73.37 (7) |
| Al21$^{iii}$—Ru5—Al23$^{iii}$ | 69.88 (2) | Si26B—Al20—Si13$^{i}$ | 153.36 (12) |
| Al27—Ru5—Al23 | 69.449 (16) | Al12B—Al20—Si13$^{i}$ | 118.3 (3) |
| Al28C$^{i}$—Ru5—Al23 | 71.17 (14) | Al20$^{ii}$—Al20—Si13 | 70.32 (5) |
| Al28B$^{i}$—Ru5—Al23 | 74.28 (16) | Si26B$^{i}$—Al20—Si13 | 153.36 (12) |
| Al28A$^{ii}$—Ru5—Al23 | 88.38 (6) | Si26B—Al20—Si13 | 73.37 (7) |
| Al28A$^{i}$—Ru5—Al23 | 72.12 (6) | Al12B—Al20—Si13 | 118.3 (3) |
| Al21—Ru5—Al23 | 69.88 (2) | Si13$^{i}$—Al20—Si13 | 103.91 (8) |
| Al21$^{iii}$—Ru5—Al23 | 145.86 (2) | Al20$^{ii}$—Al20—Al12B$^{ii}$ | 56.1 (6) |
| Al23$^{iii}$—Ru5—Al23 | 138.27 (3) | Si26B$^{i}$—Al20—Al12B$^{ii}$ | 102.4 (4) |
| Al27—Ru5—Al22 | 124.802 (18) | Si26B—Al20—Al12B$^{ii}$ | 102.4 (4) |
| Al28C$^{i}$—Ru5—Al22 | 97.0 (7) | Al12B—Al20—Al12B$^{ii}$ | 27.3 (13) |
| Al28B$^{i}$—Ru5—Al22 | 84.1 (6) | Si13$^{i}$—Al20—Al12B$^{ii}$ | 103.9 (4) |
| Al28A$^{ii}$—Ru5—Al22 | 72.13 (5) | Si13—Al20—Al12B$^{ii}$ | 103.9 (4) |
| Al28A$^{i}$—Ru5—Al22 | 61.87 (5) | Al20$^{ii}$—Al20—Al26A | 127.49 (5) |
| Al21—Ru5—Al22 | 66.94 (2) | Si26B$^{i}$—Al20—Al26A | 98.57 (10) |
| Al21$^{iii}$—Ru5—Al22 | 107.46 (2) | Si26B—Al20—Al26A | 2.89 (9) |
| Al23$^{iii}$—Ru5—Al22 | 132.77 (2) | Al12B—Al20—Al26A | 82.2 (4) |
| Al23—Ru5—Al22 | 69.40 (2) | Si13$^{i}$—Al20—Al26A | 156.21 (10) |
| Al26A$^{x}$—Si6—Al26A$^{xi}$ | 64.09 (6) | Si13—Al20—Al26A | 73.05 (3) |
| Al26A$^{x}$—Si6—Al21$^{x}$ | 62.48 (5) | Al12B$^{ii}$—Al20—Al26A | 99.7 (4) |
| Al26A$^{xi}$—Si6—Al21$^{x}$ | 116.49 (5) | Al20$^{ii}$—Al20—Al26A$^{i}$ | 127.49 (5) |
| Al26A$^{x}$—Si6—Al21$^{xi}$ | 116.49 (5) | Si26B$^{i}$—Al20—Al26A$^{i}$ | 2.89 (9) |
| Al26A$^{xi}$—Si6—Al21$^{xi}$ | 62.48 (5) | Si26B—Al20—Al26A$^{i}$ | 98.58 (10) |
| Al21$^{x}$—Si6—Al21$^{xi}$ | 117.71 (4) | Al12B—Al20—Al26A$^{i}$ | 82.2 (4) |
| Al26A$^{x}$—Si6—Al14$^{xii}$ | 116.06 (7) | Si13$^{i}$—Al20—Al26A$^{i}$ | 73.05 (3) |
| Al26A$^{xi}$—Si6—Al14$^{xii}$ | 116.06 (7) | Si13—Al20—Al26A$^{i}$ | 156.21 (10) |
| Al21$^{x}$—Si6—Al14$^{xii}$ | 116.56 (2) | Al12B$^{ii}$—Al20—Al26A$^{i}$ | 99.7 (4) |
| Al21$^{xi}$—Si6—Al14$^{xii}$ | 116.56 (2) | Al26A—Al20—Al26A$^{i}$ | 100.00 (10) |
| Al26A$^{x}$—Si6—Al23$^{xi}$ | 176.81 (7) | Al20$^{ii}$—Al20—Ru2 | 71.28 (5) |
| Al26A$^{xi}$—Si6—Al23$^{xi}$ | 117.20 (3) | Si26B$^{i}$—Al20—Ru2 | 139.65 (11) |
| Al21$^{x}$—Si6—Al23$^{xi}$ | 118.09 (3) | Si26B—Al20—Ru2 | 60.02 (8) |
| Al21$^{xi}$—Si6—Al23$^{xi}$ | 66.27 (2) | Al12B—Al20—Ru2 | 62.1 (2) |
| Al14$^{xii}$—Si6—Al23$^{xi}$ | 60.78 (3) | Si13$^{i}$—Al20—Ru2 | 141.15 (9) |
| Al26A$^{x}$—Si6—Al23$^{x}$ | 117.20 (3) | Si13—Al20—Ru2 | 56.80 (3) |
| Al26A$^{xi}$—Si6—Al23$^{x}$ | 176.81 (7) | Al12B$^{ii}$—Al20—Ru2 | 57.39 (4) |
| Al21$^{x}$—Si6—Al23$^{x}$ | 66.27 (2) | Al26A—Al20—Ru2 | 57.36 (4) |
| Al21$^{xi}$—Si6—Al23$^{x}$ | 118.09 (3) | Al26A$^{i}$—Al20—Ru2 | 138.65 (8) |
| Al14$^{xii}$—Si6—Al23$^{x}$ | 60.78 (3) | Al20$^{ii}$—Al20—Ru2$^{i}$ | 71.28 (5) |
| Al23$^{xi}$—Si6—Al23$^{x}$ | 61.35 (3) | Si26B$^{i}$—Al20—Ru2$^{i}$ | 60.03 (8) |
| Al26A$^{x}$—Si6—Al15$^{xiii}$ | 65.13 (7) | Si26B—Al20—Ru2$^{i}$ | 139.65 (11) |
| Al26A$^{xi}$—Si6—Al15$^{xiii}$ | 65.13 (7) | Al12B—Al20—Ru2$^{i}$ | 62.1 (2) |
| Al21$^{x}$—Si6—Al15$^{xiii}$ | 116.38 (2) | Si13$^{i}$—Al20—Ru2$^{i}$ | 56.80 (3) |
| Al21$^{xi}$—Si6—Al15$^{xiii}$ | 116.38 (2) | Si13—Al20—Ru2$^{i}$ | 141.15 (9) |
| Al14$^{xii}$—Si6—Al15$^{xiii}$ | 60.96 (3) | Al12B$^{ii}$—Al20—Ru2$^{i}$ | 57.39 (4) |

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| Al23$^{xi}$—Si6—Al15$^{xiii}$ | 112.46 (3) | Al26A—Al20—Ru2$^{i}$ | 138.65 (8) |
| Al23$^{x}$—Si6—Al15$^{xiii}$ | 112.46 (3) | Al26A$^{i}$—Al20—Ru2$^{i}$ | 57.36 (4) |
| Al26A$^{x}$—Si6—Al22$^{xi}$ | 115.60 (5) | Ru2—Al20—Ru2$^{i}$ | 114.71 (7) |
| Al26A$^{xi}$—Si6—Al22$^{xi}$ | 62.20 (5) | Al20$^{ii}$—Al20—Al12A | 71.86 (5) |
| Al21$^{x}$—Si6—Al22$^{xi}$ | 178.04 (4) | Si26B$^{i}$—Al20—Al12A | 92.10 (9) |
| Al21$^{xi}$—Si6—Al22$^{xi}$ | 63.25 (2) | Si26B—Al20—Al12A | 92.10 (9) |
| Al14$^{xii}$—Si6—Al22$^{xi}$ | 63.63 (2) | Al12B—Al20—Al12A | 11.6 (7) |
| Al23$^{xi}$—Si6—Al22$^{xi}$ | 63.80 (2) | Si13$^{i}$—Al20—Al12A | 112.68 (6) |
| Al23$^{x}$—Si6—Al22$^{xi}$ | 114.99 (3) | Si13—Al20—Al12A | 112.68 (6) |
| Al15$^{xiii}$—Si6—Al22$^{xi}$ | 61.86 (2) | Al12B$^{ii}$—Al20—Al12A | 15.8 (6) |
| Al26A$^{x}$—Si6—Al22$^{x}$ | 62.20 (5) | Al26A—Al20—Al12A | 89.59 (6) |
| Al26A$^{xi}$—Si6—Al22$^{x}$ | 115.60 (5) | Al26A$^{i}$—Al20—Al12A | 89.59 (6) |
| Al21$^{x}$—Si6—Al22$^{x}$ | 63.25 (2) | Ru2—Al20—Al12A | 59.21 (4) |
| Al21$^{xi}$—Si6—Al22$^{x}$ | 178.04 (4) | Ru2$^{i}$—Al20—Al12A | 59.21 (4) |
| Al14$^{xii}$—Si6—Al22$^{x}$ | 63.63 (2) | Al12B—Al21—Ru7A | 68.3 (4) |
| Al23$^{xi}$—Si6—Al22$^{x}$ | 114.99 (3) | Al12B—Al21—Ru2 | 61.1 (4) |
| Al23$^{x}$—Si6—Al22$^{x}$ | 63.80 (2) | Ru7A—Al21—Ru2 | 129.12 (10) |
| Al15$^{xiii}$—Si6—Al22$^{x}$ | 61.86 (2) | Al12B—Al21—Ru5 | 116.5 (6) |
| Al22$^{xi}$—Si6—Al22$^{x}$ | 115.73 (4) | Ru7A—Al21—Ru5 | 129.33 (4) |
| Al26A$^{x}$—Si6—Al16 | 115.32 (7) | Ru2—Al21—Ru5 | 73.60 (2) |
| Al26A$^{xi}$—Si6—Al16 | 115.32 (7) | Al12B—Al21—Ru7B | 72.2 (6) |
| Al21$^{x}$—Si6—Al16 | 63.79 (2) | Ru7A—Al21—Ru7B | 4.0 (4) |
| Al21$^{xi}$—Si6—Al16 | 63.79 (2) | Ru2—Al21—Ru7B | 133.1 (4) |
| Al14$^{xii}$—Si6—Al16 | 118.49 (4) | Ru5—Al21—Ru7B | 128.9 (2) |
| Al23$^{xi}$—Si6—Al16 | 67.08 (3) | Al12B—Al21—Si6$^{xv}$ | 128.1 (7) |
| Al23$^{x}$—Si6—Al16 | 67.08 (3) | Ru7A—Al21—Si6$^{xv}$ | 107.13 (8) |
| Al15$^{xiii}$—Si6—Al16 | 179.45 (4) | Ru2—Al21—Si6$^{xv}$ | 107.38 (3) |
| Al22$^{xi}$—Si6—Al16 | 117.98 (2) | Ru5—Al21—Si6$^{xv}$ | 105.51 (3) |
| Al22$^{x}$—Si6—Al16 | 117.98 (2) | Ru7B—Al21—Si6$^{xv}$ | 104.1 (4) |
| Al21—Ru7A—Al21$^{i}$ | 109.01 (17) | Al12B—Al21—Al12A | 16.4 (7) |
| Al21—Ru7A—Si10 | 91.59 (11) | Ru7A—Al21—Al12A | 67.88 (10) |
| Al21$^{i}$—Ru7A—Si10 | 91.59 (11) | Ru2—Al21—Al12A | 62.23 (4) |
| Al21—Ru7A—Al16$^{xiv}$ | 150.26 (7) | Ru5—Al21—Al12A | 103.42 (3) |
| Al21$^{i}$—Ru7A—Al16$^{xiv}$ | 72.21 (3) | Ru7B—Al21—Al12A | 71.9 (4) |
| Si10—Ru7A—Al16$^{xiv}$ | 118.15 (7) | Si6$^{xv}$—Al21—Al12A | 144.53 (5) |
| Al21—Ru7A—Al16$^{xv}$ | 72.21 (3) | Al12B—Al21—Al26A | 76.4 (6) |
| Al21$^{i}$—Ru7A—Al16$^{xv}$ | 150.26 (7) | Ru7A—Al21—Al26A | 115.15 (8) |
| Si10—Ru7A—Al16$^{xv}$ | 118.15 (7) | Ru2—Al21—Al26A | 57.91 (6) |
| Al16$^{xiv}$—Ru7A—Al16$^{xv}$ | 92.25 (16) | Ru5—Al21—Al26A | 114.75 (5) |
| Al21—Ru7A—Al11$^{xv}$ | 75.04 (6) | Ru7B—Al21—Al26A | 116.1 (2) |
| Al21$^{i}$—Ru7A—Al11$^{xv}$ | 75.04 (6) | Si6$^{xv}$—Al21—Al26A | 58.64 (11) |
| Si10—Ru7A—Al11$^{xv}$ | 156.3 (2) | Al12A—Al21—Al26A | 90.67 (13) |
| Al16$^{xiv}$—Ru7A—Al11$^{xv}$ | 76.80 (6) | Al12B—Al21—Al24$^{xvii}$ | 119.0 (6) |
| Al16$^{xv}$—Ru7A—Al11$^{xv}$ | 76.80 (6) | Ru7A—Al21—Al24$^{xvii}$ | 68.48 (6) |
| Al21—Ru7A—Al19$^{xvi}$ | 122.02 (4) | Ru2—Al21—Al24$^{xvii}$ | 134.06 (3) |
| Al21$^{i}$—Ru7A—Al19$^{xvi}$ | 122.02 (4) | Ru5—Al21—Al24$^{xvii}$ | 66.51 (2) |
| Si10—Ru7A—Al19$^{xvi}$ | 63.21 (5) | Ru7B—Al21—Al24$^{xvii}$ | 66.3 (3) |
| Al16$^{xiv}$—Ru7A—Al19$^{xvi}$ | 76.07 (12) | Si6$^{xv}$—Al21—Al24$^{xvii}$ | 104.48 (3) |

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| Al16$^{xv}$—Ru7A—Al19$^{xvi}$ | 76.07 (12) | Al12A—Al21—Al24$^{xvii}$ | 105.60 (6) |
| Al11$^{xv}$—Ru7A—Al19$^{xvi}$ | 140.45 (19) | Al26A—Al21—Al24$^{xvii}$ | 163.10 (12) |
| Al21—Ru7A—Al12B | 55.23 (12) | Al12B—Al21—Si26B | 66.3 (6) |
| Al21$^{i}$—Ru7A—Al12B | 55.23 (12) | Ru7A—Al21—Si26B | 109.80 (10) |
| Si10—Ru7A—Al12B | 81.9 (6) | Ru2—Al21—Si26B | 53.66 (7) |
| Al16$^{xiv}$—Ru7A—Al12B | 124.7 (3) | Ru5—Al21—Si26B | 118.00 (6) |
| Al16$^{xv}$—Ru7A—Al12B | 124.7 (3) | Ru7B—Al21—Si26B | 111.4 (3) |
| Al11$^{xv}$—Ru7A—Al12B | 74.4 (6) | Si6$^{xv}$—Al21—Si26B | 67.88 (12) |
| Al19$^{xvi}$—Ru7A—Al12B | 145.1 (6) | Al12A—Al21—Si26B | 80.63 (14) |
| Al21—Ru7A—Al12A | 58.55 (10) | Al26A—Al21—Si26B | 10.09 (5) |
| Al21$^{i}$—Ru7A—Al12A | 58.55 (10) | Al24$^{xvii}$—Al21—Si26B | 171.65 (10) |
| Si10—Ru7A—Al12A | 66.73 (11) | Al12B—Al21—Al22 | 117.9 (4) |
| Al16$^{xiv}$—Ru7A—Al12A | 130.76 (9) | Ru7A—Al21—Al22 | 169.24 (9) |
| Al16$^{xv}$—Ru7A—Al12A | 130.76 (9) | Ru2—Al21—Al22 | 58.56 (2) |
| Al11$^{xv}$—Ru7A—Al12A | 89.61 (12) | Ru5—Al21—Al22 | 57.47 (2) |
| Al19$^{xvi}$—Ru7A—Al12A | 129.94 (10) | Ru7B—Al21—Al22 | 165.9 (4) |
| Al12B—Ru7A—Al12A | 15.2 (6) | Si6$^{xv}$—Al21—Al22 | 62.12 (3) |
| Al21—Ru7A—Al24$^{xvii}$ | 59.64 (3) | Al12A—Al21—Al22 | 120.71 (5) |
| Al21$^{i}$—Ru7A—Al24$^{xvii}$ | 149.86 (17) | Al26A—Al21—Al22 | 60.68 (8) |
| Si10—Ru7A—Al24$^{xvii}$ | 62.79 (3) | Al24$^{xvii}$—Al21—Al22 | 112.49 (3) |
| Al16$^{xiv}$—Ru7A—Al24$^{xvii}$ | 132.53 (18) | Si26B—Al21—Al22 | 67.59 (10) |
| Al16$^{xv}$—Ru7A—Al24$^{xvii}$ | 57.51 (4) | Ru9$^{ix}$—Al22—Ru5 | 133.43 (3) |
| Al11$^{xv}$—Ru7A—Al24$^{xvii}$ | 122.30 (3) | Ru9$^{ix}$—Al22—Ru9 | 76.273 (19) |
| Al19$^{xvi}$—Ru7A—Al24$^{xvii}$ | 62.41 (5) | Ru5—Al22—Ru9 | 140.36 (3) |
| Al12B—Ru7A—Al24$^{xvii}$ | 102.7 (3) | Ru9$^{ix}$—Al22—Ru2 | 143.89 (3) |
| Al12A—Ru7A—Al24$^{xvii}$ | 94.82 (10) | Ru5—Al22—Ru2 | 70.857 (19) |
| Al16$^{xiv}$—Ru7B—Al16$^{xv}$ | 99.1 (8) | Ru9—Al22—Ru2 | 71.503 (19) |
| Al16$^{xiv}$—Ru7B—Al19$^{xvi}$ | 81.4 (6) | Ru9$^{ix}$—Al22—Al28A$^{i}$ | 75.76 (5) |
| Al16$^{xv}$—Ru7B—Al19$^{xvi}$ | 81.4 (6) | Ru5—Al22—Al28A$^{i}$ | 57.77 (5) |
| Al16$^{xiv}$—Ru7B—Si10 | 120.2 (3) | Ru9—Al22—Al28A$^{i}$ | 136.00 (5) |
| Al16$^{xv}$—Ru7B—Si10 | 120.2 (3) | Ru2—Al22—Al28A$^{i}$ | 118.07 (6) |
| Al19$^{xvi}$—Ru7B—Si10 | 64.2 (3) | Ru9$^{ix}$—Al22—Al26A | 116.62 (6) |
| Al16$^{xiv}$—Ru7B—Al21 | 150.9 (5) | Ru5—Al22—Al26A | 109.46 (5) |
| Al16$^{xv}$—Ru7B—Al21 | 72.18 (11) | Ru9—Al22—Al26A | 55.78 (4) |
| Al19$^{xvi}$—Ru7B—Al21 | 123.0 (2) | Ru2—Al22—Al26A | 55.35 (9) |
| Si10—Ru7B—Al21 | 87.1 (5) | Al28A$^{i}$—Al22—Al26A | 166.65 (6) |
| Al16$^{xiv}$—Ru7B—Al21$^{i}$ | 72.18 (11) | Ru9$^{ix}$—Al22—Si6$^{xv}$ | 102.48 (3) |
| Al16$^{xv}$—Ru7B—Al21$^{i}$ | 150.9 (5) | Ru5—Al22—Si6$^{xv}$ | 98.12 (3) |
| Al19$^{xvi}$—Ru7B—Al21$^{i}$ | 123.0 (2) | Ru9—Al22—Si6$^{xv}$ | 99.13 (3) |
| Si10—Ru7B—Al21$^{i}$ | 87.1 (5) | Ru2—Al22—Si6$^{xv}$ | 98.35 (3) |
| Al21—Ru7B—Al21$^{i}$ | 101.7 (8) | Al28A$^{i}$—Al22—Si6$^{xv}$ | 119.65 (6) |
| Al16$^{xiv}$—Ru7B—Al11$^{xv}$ | 78.6 (3) | Al26A—Al22—Si6$^{xv}$ | 54.96 (8) |
| Al16$^{xv}$—Ru7B—Al11$^{xv}$ | 78.6 (3) | Ru9$^{ix}$—Al22—Al21 | 156.62 (3) |
| Al19$^{xvi}$—Ru7B—Al11$^{xv}$ | 148.8 (10) | Ru5—Al22—Al21 | 55.59 (2) |
| Si10—Ru7B—Al11$^{xv}$ | 147.0 (10) | Ru9—Al22—Al21 | 109.46 (3) |
| Al21—Ru7B—Al11$^{xv}$ | 72.6 (4) | Ru2—Al22—Al21 | 54.75 (2) |
| Al21$^{i}$—Ru7B—Al11$^{xv}$ | 72.6 (4) | Al28A$^{i}$—Al22—Al21 | 109.73 (5) |
| Al16$^{xiv}$—Ru7B—Al24$^{xvii}$ | 140.6 (9) | Al26A—Al22—Al21 | 56.94 (4) |

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| Al16$^{xv}$—Ru7B—Al24$^{xvii}$ | 58.93 (16) | Si6$^{xv}$—Al22—Al21 | 54.63 (2) |
| Al19$^{xvi}$—Ru7B—Al24$^{xvii}$ | 64.3 (3) | Ru9$^{ix}$—Al22—Al15$^{i}$ | 56.09 (2) |
| Si10—Ru7B—Al24$^{xvii}$ | 62.3 (2) | Ru5—Al22—Al15$^{i}$ | 112.97 (3) |
| Al21—Ru7B—Al24$^{xvii}$ | 58.76 (13) | Ru9—Al22—Al15$^{i}$ | 56.57 (2) |
| Al21$^{i}$—Ru7B—Al24$^{xvii}$ | 142.6 (8) | Ru2—Al22—Al15$^{i}$ | 91.92 (3) |
| Al11$^{xv}$—Ru7B—Al24$^{xvii}$ | 122.0 (2) | Al28A$^{i}$—Al22—Al15$^{i}$ | 79.64 (5) |
| Al16$^{xiv}$—Ru7B—Al24$^{xvi}$ | 58.93 (16) | Al26A—Al22—Al15$^{i}$ | 110.98 (5) |
| Al16$^{xv}$—Ru7B—Al24$^{xvi}$ | 140.6 (9) | Si6$^{xv}$—Al22—Al15$^{i}$ | 148.91 (3) |
| Al19$^{xvi}$—Ru7B—Al24$^{xvi}$ | 64.3 (3) | Al21—Al22—Al15$^{i}$ | 146.28 (3) |
| Si10—Ru7B—Al24$^{xvi}$ | 62.3 (2) | Ru9$^{ix}$—Al22—Al22$^{iii}$ | 109.401 (18) |
| Al21—Ru7B—Al24$^{xvi}$ | 142.6 (8) | Ru5—Al22—Al22$^{iii}$ | 56.521 (16) |
| Al21$^{i}$—Ru7B—Al24$^{xvi}$ | 58.76 (13) | Ru9—Al22—Al22$^{iii}$ | 92.250 (17) |
| Al11$^{xv}$—Ru7B—Al24$^{xvi}$ | 122.0 (2) | Ru2—Al22—Al22$^{iii}$ | 57.038 (17) |
| Al24$^{xvii}$—Ru7B—Al24$^{xvi}$ | 115.8 (4) | Al28A$^{i}$—Al22—Al22$^{iii}$ | 66.38 (5) |
| Al16$^{xiv}$—Ru7B—Ru7B$^{xviii}$ | 51.5 (3) | Al26A—Al22—Al22$^{iii}$ | 111.14 (9) |
| Al16$^{xv}$—Ru7B—Ru7B$^{xviii}$ | 51.5 (3) | Si6$^{xv}$—Al22—Al22$^{iii}$ | 147.868 (19) |
| Al19$^{xvi}$—Ru7B—Ru7B$^{xviii}$ | 93.1 (4) | Al21—Al22—Al22$^{iii}$ | 93.25 (2) |
| Si10—Ru7B—Ru7B$^{xviii}$ | 157.3 (5) | Al15$^{i}$—Al22—Al22$^{iii}$ | 59.955 (17) |
| Al21—Ru7B—Ru7B$^{xviii}$ | 106.9 (3) | Ru9$^{ix}$—Al22—Al14$^{ix}$ | 55.43 (2) |
| Al21$^{i}$—Ru7B—Ru7B$^{xviii}$ | 106.9 (3) | Ru5—Al22—Al14$^{ix}$ | 108.75 (3) |
| Al11$^{xv}$—Ru7B—Ru7B$^{xviii}$ | 55.8 (5) | Ru9—Al22—Al14$^{ix}$ | 110.44 (3) |
| Al24$^{xvii}$—Ru7B—Ru7B$^{xviii}$ | 109.2 (4) | Ru2—Al22—Al14$^{ix}$ | 153.68 (4) |
| Al24$^{xvi}$—Ru7B—Ru7B$^{xviii}$ | 109.2 (4) | Al28A$^{i}$—Al22—Al14$^{ix}$ | 79.63 (6) |
| Ru8$^{xviii}$—Ru8—Si26B$^{i}$ | 130.06 (17) | Al26A—Al22—Al14$^{ix}$ | 102.89 (9) |
| Ru8$^{xviii}$—Ru8—Si26B | 130.06 (17) | Si6$^{xv}$—Al22—Al14$^{ix}$ | 55.36 (3) |
| Si26B$^{i}$—Ru8—Si26B | 93.3 (3) | Al21—Al22—Al14$^{ix}$ | 102.32 (3) |
| Ru8$^{xviii}$—Ru8—Si18 | 117.55 (5) | Al15$^{i}$—Al22—Al14$^{ix}$ | 111.30 (3) |
| Si26B$^{i}$—Ru8—Si18 | 85.04 (12) | Al22$^{iii}$—Al22—Al14$^{ix}$ | 145.76 (2) |
| Si26B—Ru8—Si18 | 85.03 (12) | Ru4$^{ix}$—Al23—Ru5 | 139.89 (3) |
| Ru8$^{xviii}$—Ru8—Al26A | 119.05 (12) | Ru4$^{ix}$—Al23—Ru4$^{xv}$ | 77.88 (2) |
| Si26B$^{i}$—Ru8—Al26A | 102.7 (2) | Ru5—Al23—Ru4$^{xv}$ | 129.65 (3) |
| Si26B—Ru8—Al26A | 11.05 (8) | Ru4$^{ix}$—Al23—Al24$^{xvii}$ | 137.82 (3) |
| Si18—Ru8—Al26A | 91.76 (9) | Ru5—Al23—Al24$^{xvii}$ | 66.20 (2) |
| Ru8$^{xviii}$—Ru8—Al26A$^{i}$ | 119.05 (12) | Ru4$^{xv}$—Al23—Al24$^{xvii}$ | 64.62 (2) |
| Si26B$^{i}$—Ru8—Al26A$^{i}$ | 11.05 (8) | Ru4$^{ix}$—Al23—Al14$^{ix}$ | 57.47 (2) |
| Si26B—Ru8—Al26A$^{i}$ | 102.7 (2) | Ru5—Al23—Al14$^{ix}$ | 114.11 (3) |
| Si18—Ru8—Al26A$^{i}$ | 91.76 (9) | Ru4$^{xv}$—Al23—Al14$^{ix}$ | 115.33 (3) |
| Al26A—Ru8—Al26A$^{i}$ | 111.25 (18) | Al24$^{xvii}$—Al23—Al14$^{ix}$ | 157.49 (4) |
| Ru8$^{xviii}$—Ru8—Si26B$^{xviii}$ | 43.07 (15) | Ru4$^{ix}$—Al23—Si6$^{xv}$ | 103.97 (3) |
| Si26B$^{i}$—Ru8—Si26B$^{xviii}$ | 87.0 (3) | Ru5—Al23—Si6$^{xv}$ | 99.99 (2) |
| Si26B—Ru8—Si26B$^{xviii}$ | 153.06 (14) | Ru4$^{xv}$—Al23—Si6$^{xv}$ | 98.39 (3) |
| Si18—Ru8—Si26B$^{xviii}$ | 121.78 (6) | Al24$^{xvii}$—Al23—Si6$^{xv}$ | 100.07 (3) |
| Al26A—Ru8—Si26B$^{xviii}$ | 146.00 (8) | Al14$^{ix}$—Al23—Si6$^{xv}$ | 57.43 (3) |
| Al26A$^{i}$—Ru8—Si26B$^{xviii}$ | 76.0 (3) | Ru4$^{ix}$—Al23—Al27 | 102.08 (2) |
| Ru8$^{xviii}$—Ru8—Si26B$^{xix}$ | 43.07 (15) | Ru5—Al23—Al27 | 51.056 (15) |
| Si26B$^{i}$—Ru8—Si26B$^{xix}$ | 153.05 (14) | Ru4$^{xv}$—Al23—Al27 | 99.56 (2) |
| Si26B—Ru8—Si26B$^{xix}$ | 87.0 (3) | Al24$^{xvii}$—Al23—Al27 | 67.82 (2) |
| Si18—Ru8—Si26B$^{xix}$ | 121.78 (6) | Al14$^{ix}$—Al23—Al27 | 131.35 (3) |

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| Al26A—Ru8—Si26B$^{xix}$ | 76.0 (3) | Si6$^{xv}$—Al23—Al27 | 150.89 (3) |
| Al26A$^{i}$—Ru8—Si26B$^{xix}$ | 146.00 (8) | Ru4$^{ix}$—Al23—Al23$^{xix}$ | 56.121 (17) |
| Si26B$^{xviii}$—Ru8—Si26B$^{xix}$ | 80.9 (3) | Ru5—Al23—Al23$^{xix}$ | 159.133 (17) |
| Ru8$^{xviii}$—Ru8—Al11$^{xv}$ | 85.69 (4) | Ru4$^{xv}$—Al23—Al23$^{xix}$ | 57.583 (16) |
| Si26B$^{i}$—Ru8—Al11$^{xv}$ | 79.09 (8) | Al24$^{xvii}$—Al23—Al23$^{xix}$ | 112.01 (2) |
| Si26B—Ru8—Al11$^{xv}$ | 79.10 (8) | Al14$^{ix}$—Al23—Al23$^{xix}$ | 58.992 (18) |
| Si18—Ru8—Al11$^{xv}$ | 156.75 (8) | Si6$^{xv}$—Al23—Al23$^{xix}$ | 59.325 (17) |
| Al26A—Ru8—Al11$^{xv}$ | 75.48 (5) | Al27—Al23—Al23$^{xix}$ | 149.293 (14) |
| Al26A$^{i}$—Ru8—Al11$^{xv}$ | 75.48 (5) | Ru4$^{ix}$—Al23—Al23$^{xxiii}$ | 58.09 (2) |
| Si26B$^{xviii}$—Ru8—Al11$^{xv}$ | 74.51 (7) | Ru5—Al23—Al23$^{xxiii}$ | 110.021 (16) |
| Si26B$^{xix}$—Ru8—Al11$^{xv}$ | 74.51 (7) | Ru4$^{xv}$—Al23—Al23$^{xxiii}$ | 54.723 (19) |
| Ru8$^{xviii}$—Ru8—Al18$^{xviii}$ | 54.98 (4) | Al24$^{xvii}$—Al23—Al23$^{xxiii}$ | 83.77 (3) |
| Si26B$^{i}$—Ru8—Al18$^{xviii}$ | 124.37 (8) | Al14$^{ix}$—Al23—Al23$^{xxiii}$ | 115.24 (4) |
| Si26B—Ru8—Al18$^{xviii}$ | 124.36 (8) | Si6$^{xv}$—Al23—Al23$^{xxiii}$ | 148.424 (19) |
| Si18—Ru8—Al18$^{xviii}$ | 62.58 (5) | Al27—Al23—Al23$^{xxiii}$ | 59.293 (14) |
| Al26A—Ru8—Al18$^{xviii}$ | 120.97 (5) | Al23$^{xix}$—Al23—Al23$^{xxiii}$ | 90.0 |
| Al26A$^{i}$—Ru8—Al18$^{xviii}$ | 120.97 (5) | Ru4$^{ix}$—Al23—Al28C$^{i}$ | 90.8 (4) |
| Si26B$^{xviii}$—Ru8—Al18$^{xviii}$ | 75.82 (12) | Ru5—Al23—Al28C$^{i}$ | 50.8 (4) |
| Si26B$^{xix}$—Ru8—Al18$^{xviii}$ | 75.82 (12) | Ru4$^{xv}$—Al23—Al28C$^{i}$ | 123.1 (7) |
| Al11$^{xv}$—Ru8—Al18$^{xviii}$ | 140.67 (8) | Al24$^{xvii}$—Al23—Al28C$^{i}$ | 93.8 (6) |
| Ru8$^{xviii}$—Ru8—Al26A$^{xviii}$ | 53.64 (11) | Al14$^{ix}$—Al23—Al28C$^{i}$ | 103.3 (7) |
| Si26B$^{i}$—Ru8—Al26A$^{xviii}$ | 76.4 (3) | Si6$^{xv}$—Al23—Al28C$^{i}$ | 138.2 (7) |
| Si26B—Ru8—Al26A$^{xviii}$ | 150.61 (9) | Al27—Al23—Al28C$^{i}$ | 28.5 (7) |
| Si18—Ru8—Al26A$^{xviii}$ | 120.64 (4) | Al23$^{xix}$—Al23—Al28C$^{i}$ | 146.9 (4) |
| Al26A—Ru8—Al26A$^{xviii}$ | 147.02 (8) | Al23$^{xxiii}$—Al23—Al28C$^{i}$ | 71.9 (6) |
| Al26A$^{i}$—Ru8—Al26A$^{xviii}$ | 65.4 (2) | Ru4$^{ix}$—Al23—Al21 | 158.01 (3) |
| Si26B$^{xviii}$—Ru8—Al26A$^{xviii}$ | 10.60 (7) | Ru5—Al23—Al21 | 54.62 (2) |
| Si26B$^{xix}$—Ru8—Al26A$^{xviii}$ | 90.2 (2) | Ru4$^{xv}$—Al23—Al21 | 104.25 (3) |
| Al11$^{xv}$—Ru8—Al26A$^{xviii}$ | 71.98 (4) | Al24$^{xvii}$—Al23—Al21 | 57.17 (2) |
| Al18$^{xviii}$—Ru8—Al26A$^{xviii}$ | 82.95 (9) | Al14$^{ix}$—Al23—Al21 | 103.50 (3) |
| Si13—Ru9—Al22$^{ix}$ | 143.18 (3) | Si6$^{xv}$—Al23—Al21 | 54.05 (2) |
| Si13—Ru9—Al14 | 74.93 (3) | Al27—Al23—Al21 | 99.14 (3) |
| Al22$^{ix}$—Ru9—Al14 | 69.25 (2) | Al23$^{xix}$—Al23—Al21 | 106.01 (2) |
| Si13—Ru9—Al26A | 76.19 (12) | Al23$^{xxiii}$—Al23—Al21 | 140.86 (4) |
| Al22$^{ix}$—Ru9—Al26A | 137.56 (11) | Al28C$^{i}$—Al23—Al21 | 105.4 (4) |
| Al14—Ru9—Al26A | 150.45 (13) | Ru4$^{ix}$—Al23—Al22 | 112.68 (3) |
| Si13—Ru9—Al15$^{xx}$ | 144.71 (3) | Ru5—Al23—Al22 | 55.75 (2) |
| Al22$^{ix}$—Ru9—Al15$^{xx}$ | 68.60 (3) | Ru4$^{xv}$—Al23—Al22 | 156.11 (3) |
| Al14—Ru9—Al15$^{xx}$ | 137.45 (3) | Al24$^{xvii}$—Al23—Al22 | 109.38 (3) |
| Al26A—Ru9—Al15$^{xx}$ | 69.48 (11) | Al14$^{ix}$—Al23—Al22 | 60.73 (2) |
| Si13—Ru9—Al15$^{i}$ | 104.138 (19) | Si6$^{xv}$—Al23—Al22 | 58.86 (2) |
| Al22$^{ix}$—Ru9—Al15$^{i}$ | 68.15 (2) | Al27—Al23—Al22 | 98.94 (3) |
| Al14—Ru9—Al15$^{i}$ | 64.92 (3) | Al23$^{xix}$—Al23—Al22 | 109.21 (2) |
| Al26A—Ru9—Al15$^{i}$ | 129.36 (6) | Al23$^{xxiii}$—Al23—Al22 | 149.15 (4) |
| Al15$^{xx}$—Ru9—Al15$^{i}$ | 103.749 (11) | Al28C$^{i}$—Al23—Al22 | 79.3 (7) |
| Si13—Ru9—Al22 | 105.35 (3) | Al21—Al23—Al22 | 57.77 (2) |
| Al22$^{ix}$—Ru9—Al22 | 103.725 (19) | Al28C$^{xx}$—Al24—Ru3$^{xx}$ | 71.1 (7) |
| Al14—Ru9—Al22 | 129.31 (2) | Al28C$^{xx}$—Al24—Al16 | 144.5 (3) |

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| Al26A—Ru9—Al22 | 65.23 (9) | Ru3$^{xx}$—Al24—Al16 | 129.42 (4) |
| Al15$^{xx}$—Ru9—Al22 | 67.48 (2) | Al28C$^{xx}$—Al24—Al28B$^{xx}$ | 13.5 (6) |
| Al15$^{i}$—Ru9—Al22 | 66.15 (3) | Ru3$^{xx}$—Al24—Al28B$^{xx}$ | 60.3 (5) |
| Si13—Ru9—Si17B$^{xx}$ | 102.8 (4) | Al16—Al24—Al28B$^{xx}$ | 144.0 (2) |
| Al22$^{ix}$—Ru9—Si17B$^{xx}$ | 82.4 (5) | Al28C$^{xx}$—Al24—Al23$^{x}$ | 80.9 (7) |
| Al14—Ru9—Si17B$^{xx}$ | 110.4 (4) | Ru3$^{xx}$—Al24—Al23$^{x}$ | 151.18 (4) |
| Al26A—Ru9—Si17B$^{xx}$ | 70.2 (5) | Al16—Al24—Al23$^{x}$ | 72.20 (4) |
| Al15$^{xx}$—Ru9—Si17B$^{xx}$ | 58.2 (2) | Al28B$^{xx}$—Al24—Al23$^{x}$ | 90.9 (5) |
| Al15$^{i}$—Ru9—Si17B$^{xx}$ | 150.0 (5) | Al28C$^{xx}$—Al24—Al21$^{x}$ | 122.4 (8) |
| Al22—Ru9—Si17B$^{xx}$ | 118.4 (3) | Ru3$^{xx}$—Al24—Al21$^{x}$ | 136.11 (3) |
| Si13—Ru9—Si26B | 66.13 (13) | Al16—Al24—Al21$^{x}$ | 66.43 (3) |
| Al22$^{ix}$—Ru9—Si26B | 145.78 (11) | Al28B$^{xx}$—Al24—Al21$^{x}$ | 135.6 (5) |
| Al14—Ru9—Si26B | 139.92 (13) | Al23$^{x}$—Al24—Al21$^{x}$ | 65.80 (3) |
| Al26A—Ru9—Si26B | 10.56 (5) | Al28C$^{xx}$—Al24—Al25 | 82.2 (8) |
| Al15$^{xx}$—Ru9—Si26B | 79.06 (13) | Ru3$^{xx}$—Al24—Al25 | 58.88 (2) |
| Al15$^{i}$—Ru9—Si26B | 132.98 (6) | Al16—Al24—Al25 | 86.60 (4) |
| Al22—Ru9—Si26B | 72.46 (10) | Al28B$^{xx}$—Al24—Al25 | 70.0 (5) |
| Si17B$^{xx}$—Ru9—Si26B | 71.0 (6) | Al23$^{x}$—Al24—Al25 | 111.61 (3) |
| Si13—Ru9—Al17A$^{xx}$ | 94.94 (4) | Al21$^{x}$—Al24—Al25 | 152.63 (4) |
| Al22$^{ix}$—Ru9—Al17A$^{xx}$ | 94.80 (5) | Al28C$^{xx}$—Al24—Al24$^{xix}$ | 55.8 (3) |
| Al14—Ru9—Al17A$^{xx}$ | 118.76 (4) | Ru3$^{xx}$—Al24—Al24$^{xix}$ | 56.826 (17) |
| Al26A—Ru9—Al17A$^{xx}$ | 57.86 (6) | Al16—Al24—Al24$^{xix}$ | 157.27 (3) |
| Al15$^{xx}$—Ru9—Al17A$^{xx}$ | 59.96 (3) | Al28B$^{xx}$—Al24—Al24$^{xix}$ | 58.6 (2) |
| Al15$^{i}$—Ru9—Al17A$^{xx}$ | 160.71 (4) | Al23$^{x}$—Al24—Al24$^{xix}$ | 112.00 (2) |
| Al22—Ru9—Al17A$^{xx}$ | 111.76 (4) | Al21$^{x}$—Al24—Al24$^{xix}$ | 94.28 (2) |
| Si17B$^{xx}$—Ru9—Al17A$^{xx}$ | 13.0 (5) | Al25—Al24—Al24$^{xix}$ | 110.87 (3) |
| Si26B—Ru9—Al17A$^{xx}$ | 58.07 (8) | Al28C$^{xx}$—Al24—Si10$^{xxvii}$ | 112.9 (4) |
| Ru7A$^{ii}$—Si10—Ru7A | 125.3 (2) | Ru3$^{xx}$—Al24—Si10$^{xxvii}$ | 58.14 (3) |
| Ru7A$^{ii}$—Si10—Ru7B$^{ii}$ | 4.6 (4) | Al16—Al24—Si10$^{xxvii}$ | 102.42 (3) |
| Ru7A—Si10—Ru7B$^{ii}$ | 129.9 (6) | Al28B$^{xx}$—Al24—Si10$^{xxvii}$ | 109.2 (3) |
| Ru7A$^{ii}$—Si10—Ru7B | 129.9 (6) | Al23$^{x}$—Al24—Si10$^{xxvii}$ | 144.16 (4) |
| Ru7A—Si10—Ru7B | 4.6 (4) | Al21$^{x}$—Al24—Si10$^{xxvii}$ | 79.43 (4) |
| Ru7B$^{ii}$—Si10—Ru7B | 134.5 (10) | Al25—Al24—Si10$^{xxvii}$ | 103.20 (4) |
| Ru7A$^{ii}$—Si10—Ru3$^{xxiv}$ | 112.02 (9) | Al24$^{xix}$—Al24—Si10$^{xxvii}$ | 60.455 (15) |
| Ru7A—Si10—Ru3$^{xxiv}$ | 112.02 (9) | Al28C$^{xx}$—Al24—Ru4 | 92.4 (3) |
| Ru7B$^{ii}$—Si10—Ru3$^{xxiv}$ | 108.4 (4) | Ru3$^{xx}$—Al24—Ru4 | 116.86 (3) |
| Ru7B—Si10—Ru3$^{xxiv}$ | 108.4 (4) | Al16—Al24—Ru4 | 53.47 (3) |
| Ru7A$^{ii}$—Si10—Ru3$^{vi}$ | 112.02 (9) | Al28B$^{xx}$—Al24—Ru4 | 90.57 (19) |
| Ru7A—Si10—Ru3$^{vi}$ | 112.02 (9) | Al23$^{x}$—Al24—Ru4 | 56.57 (2) |
| Ru7B$^{ii}$—Si10—Ru3$^{vi}$ | 108.4 (4) | Al21$^{x}$—Al24—Ru4 | 104.72 (3) |
| Ru7B—Si10—Ru3$^{vi}$ | 108.4 (4) | Al25—Al24—Ru4 | 58.66 (2) |
| Ru3$^{xxiv}$—Si10—Ru3$^{vi}$ | 70.63 (3) | Al24$^{xix}$—Al24—Ru4 | 148.210 (16) |
| Ru7A$^{ii}$—Si10—Al19$^{xxi}$ | 60.62 (11) | Si10$^{xxvii}$—Al24—Ru4 | 147.42 (3) |
| Ru7A—Si10—Al19$^{xxi}$ | 174.09 (12) | Al28C$^{xx}$—Al24—Al19 | 128.9 (8) |
| Ru7B$^{ii}$—Si10—Al19$^{xxi}$ | 56.0 (5) | Ru3$^{xx}$—Al24—Al19 | 61.31 (3) |
| Ru7B—Si10—Al19$^{xxi}$ | 169.5 (5) | Al16—Al24—Al19 | 69.38 (4) |
| Ru3$^{xxiv}$—Si10—Al19$^{xxi}$ | 63.41 (3) | Al28B$^{xx}$—Al24—Al19 | 115.7 (5) |
| Ru3$^{vi}$—Si10—Al19$^{xxi}$ | 63.41 (3) | Al23$^{x}$—Al24—Al19 | 140.66 (4) |

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| Ru7A$^{ii}$—Si10—Al19$^{xvi}$ | 174.09 (12) | Al21$^{x}$—Al24—Al19 | 105.11 (3) |
| Ru7A—Si10—Al19$^{xvi}$ | 60.62 (11) | Al25—Al24—Al19 | 58.34 (3) |
| Ru7B$^{ii}$—Si10—Al19$^{xvi}$ | 169.5 (5) | Al24$^{xix}$—Al24—Al19 | 106.70 (3) |
| Ru7B—Si10—Al19$^{xvi}$ | 56.0 (5) | Si10$^{xxvii}$—Al24—Al19 | 55.54 (3) |
| Ru3$^{xxiv}$—Si10—Al19$^{xvi}$ | 63.41 (3) | Ru4—Al24—Al19 | 92.85 (3) |
| Ru3$^{vi}$—Si10—Al19$^{xvi}$ | 63.41 (3) | Al28C$^{xx}$—Al24—Ru5$^{xxvii}$ | 68.3 (8) |
| Al19$^{xxi}$—Si10—Al19$^{xvi}$ | 113.47 (6) | Ru3$^{xx}$—Al24—Ru5$^{xxvii}$ | 117.27 (3) |
| Ru7A$^{ii}$—Si10—Al24$^{xxi}$ | 66.31 (4) | Al16—Al24—Ru5$^{xxvii}$ | 111.16 (4) |
| Ru7A—Si10—Al24$^{xxi}$ | 118.30 (3) | Al28B$^{xx}$—Al24—Ru5$^{xxvii}$ | 81.4 (5) |
| Ru7B$^{ii}$—Si10—Al24$^{xxi}$ | 64.89 (15) | Al23$^{x}$—Al24—Ru5$^{xxvii}$ | 54.85 (2) |
| Ru7B—Si10—Al24$^{xxi}$ | 119.03 (7) | Al21$^{x}$—Al24—Ru5$^{xxvii}$ | 54.16 (2) |
| Ru3$^{xxiv}$—Si10—Al24$^{xxi}$ | 55.588 (19) | Al25—Al24—Ru5$^{xxvii}$ | 148.62 (4) |
| Ru3$^{vi}$—Si10—Al24$^{xxi}$ | 115.89 (4) | Al24$^{xix}$—Al24—Ru5$^{xxvii}$ | 61.040 (15) |
| Al19$^{xxi}$—Si10—Al24$^{xxi}$ | 62.902 (19) | Si10$^{xxvii}$—Al24—Ru5$^{xxvii}$ | 98.06 (3) |
| Al19$^{xvi}$—Si10—Al24$^{xxi}$ | 111.66 (3) | Ru4—Al24—Ru5$^{xxvii}$ | 110.63 (2) |
| Ru7A$^{ii}$—Si10—Al24$^{xvi}$ | 118.31 (3) | Al19—Al24—Ru5$^{xxvii}$ | 151.32 (3) |
| Ru7A—Si10—Al24$^{xvi}$ | 66.31 (4) | Si13—Al25—Al28A$^{xx}$ | 124.19 (6) |
| Ru7B$^{ii}$—Si10—Al24$^{xvi}$ | 119.03 (7) | Si13—Al25—Ru3$^{xx}$ | 131.16 (3) |
| Ru7B—Si10—Al24$^{xvi}$ | 64.90 (15) | Al28A$^{xx}$—Al25—Ru3$^{xx}$ | 60.04 (5) |
| Ru3$^{xxiv}$—Si10—Al24$^{xvi}$ | 115.89 (4) | Si13—Al25—Al14 | 69.92 (3) |
| Ru3$^{vi}$—Si10—Al24$^{xvi}$ | 55.588 (19) | Al28A$^{xx}$—Al25—Al14 | 84.62 (5) |
| Al19$^{xxi}$—Si10—Al24$^{xvi}$ | 111.66 (3) | Ru3$^{xx}$—Al25—Al14 | 144.54 (4) |
| Al19$^{xvi}$—Si10—Al24$^{xvi}$ | 62.902 (18) | Si13—Al25—Al19 | 107.28 (4) |
| Al24$^{xxi}$—Si10—Al24$^{xvi}$ | 170.96 (6) | Al28A$^{xx}$—Al25—Al19 | 119.27 (6) |
| Ru7A$^{ii}$—Si10—Al24$^{xvii}$ | 118.31 (3) | Ru3$^{xx}$—Al25—Al19 | 62.41 (3) |
| Ru7A—Si10—Al24$^{xvii}$ | 66.31 (4) | Al14—Al25—Al19 | 147.27 (5) |
| Ru7B$^{ii}$—Si10—Al24$^{xvii}$ | 119.03 (7) | Si13—Al25—Ru4 | 110.10 (3) |
| Ru7B—Si10—Al24$^{xvii}$ | 64.90 (15) | Al28A$^{xx}$—Al25—Ru4 | 92.85 (5) |
| Ru3$^{xxiv}$—Si10—Al24$^{xvii}$ | 55.588 (19) | Ru3$^{xx}$—Al25—Ru4 | 118.47 (3) |
| Ru3$^{vi}$—Si10—Al24$^{xvii}$ | 115.89 (4) | Al14—Al25—Ru4 | 56.01 (2) |
| Al19$^{xxi}$—Si10—Al24$^{xvii}$ | 111.66 (3) | Al19—Al25—Ru4 | 98.03 (3) |
| Al19$^{xvi}$—Si10—Al24$^{xvii}$ | 62.902 (19) | Si13—Al25—Al24 | 164.76 (5) |
| Al24$^{xxi}$—Si10—Al24$^{xvii}$ | 59.09 (3) | Al28A$^{xx}$—Al25—Al24 | 70.66 (5) |
| Al24$^{xvi}$—Si10—Al24$^{xvii}$ | 120.09 (3) | Ru3$^{xx}$—Al25—Al24 | 56.71 (2) |
| Ru7A$^{ii}$—Si10—Al24$^{xxii}$ | 66.31 (4) | Al14—Al25—Al24 | 111.40 (4) |
| Ru7A—Si10—Al24$^{xxii}$ | 118.30 (3) | Al19—Al25—Al24 | 62.90 (3) |
| Ru7B$^{ii}$—Si10—Al24$^{xxii}$ | 64.89 (15) | Ru4—Al25—Al24 | 62.46 (2) |
| Ru7B—Si10—Al24$^{xxii}$ | 119.03 (7) | Si13—Al25—Si17B$^{xx}$ | 94.5 (4) |
| Ru3$^{xxiv}$—Si10—Al24$^{xxii}$ | 115.89 (4) | Al28A$^{xx}$—Al25—Si17B$^{xx}$ | 42.9 (5) |
| Ru3$^{vi}$—Si10—Al24$^{xxii}$ | 55.588 (19) | Ru3$^{xx}$—Al25—Si17B$^{xx}$ | 54.1 (2) |
| Al19$^{xxi}$—Si10—Al24$^{xxii}$ | 62.902 (19) | Al14—Al25—Si17B$^{xx}$ | 102.6 (3) |
| Al19$^{xvi}$—Si10—Al24$^{xxii}$ | 111.66 (3) | Al19—Al25—Si17B$^{xx}$ | 110.1 (3) |
| Al24$^{xxi}$—Si10—Al24$^{xxii}$ | 120.09 (3) | Ru4—Al25—Si17B$^{xx}$ | 135.0 (5) |
| Al24$^{xvi}$—Si10—Al24$^{xxii}$ | 59.09 (3) | Al24—Al25—Si17B$^{xx}$ | 99.8 (3) |
| Al24$^{xvii}$—Si10—Al24$^{xxii}$ | 170.96 (6) | Si13—Al25—Ru9 | 52.79 (2) |
| Ru8$^{xxv}$—Al11—Ru8$^{xi}$ | 8.64 (8) | Al28A$^{xx}$—Al25—Ru9 | 71.76 (5) |
| Ru8$^{xxv}$—Al11—Ru7A$^{xi}$ | 145.33 (12) | Ru3$^{xx}$—Al25—Ru9 | 110.61 (3) |
| Ru8$^{xi}$—Al11—Ru7A$^{xi}$ | 136.69 (12) | Al14—Al25—Ru9 | 55.04 (2) |

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| Ru8$^{xxv}$—Al11—Ru7A$^{xxv}$ | 136.69 (12) | Al19—Al25—Ru9 | 149.49 (4) |
| Ru8$^{xi}$—Al11—Ru7A$^{xxv}$ | 145.33 (12) | Ru4—Al25—Ru9 | 110.23 (3) |
| Ru7A$^{xi}$—Al11—Ru7A$^{xxv}$ | 78.0 (2) | Al24—Al25—Ru9 | 141.11 (4) |
| Ru8$^{xxv}$—Al11—Ru7B$^{xi}$ | 150.1 (5) | Si17B$^{xx}$—Al25—Ru9 | 56.5 (2) |
| Ru8$^{xi}$—Al11—Ru7B$^{xi}$ | 141.4 (5) | Si13—Al25—Si18 | 76.05 (3) |
| Ru7A$^{xi}$—Al11—Ru7B$^{xi}$ | 4.7 (4) | Al28A$^{xx}$—Al25—Si18 | 105.43 (6) |
| Ru7A$^{xxv}$—Al11—Ru7B$^{xi}$ | 73.2 (6) | Ru3$^{xx}$—Al25—Si18 | 58.55 (3) |
| Ru8$^{xxv}$—Al11—Ru7B$^{xxv}$ | 141.4 (5) | Al14—Al25—Si18 | 143.89 (4) |
| Ru8$^{xi}$—Al11—Ru7B$^{xxv}$ | 150.1 (5) | Al19—Al25—Si18 | 55.73 (3) |
| Ru7A$^{xi}$—Al11—Ru7B$^{xxv}$ | 73.2 (6) | Ru4—Al25—Si18 | 152.96 (4) |
| Ru7A$^{xxv}$—Al11—Ru7B$^{xxv}$ | 4.7 (4) | Al24—Al25—Si18 | 104.62 (4) |
| Ru7B$^{xi}$—Al11—Ru7B$^{xxv}$ | 68.5 (10) | Si17B$^{xx}$—Al25—Si18 | 68.0 (5) |
| Al12B$^{ii}$—Al12A—Al12B | 108 (3) | Ru9—Al25—Si18 | 94.56 (3) |
| Al12B$^{ii}$—Al12A—Al21$^{iii}$ | 67.5 (8) | Si26B—Al26A—Ru8 | 56.5 (4) |
| Al12B—Al12A—Al21$^{iii}$ | 127.4 (4) | Si26B—Al26A—Ru2 | 73.2 (4) |
| Al12B$^{ii}$—Al12A—Al21$^{i}$ | 127.4 (4) | Ru8—Al26A—Ru2 | 127.6 (2) |
| Al12B—Al12A—Al21$^{i}$ | 67.5 (8) | Si26B—Al26A—Ru9 | 101.8 (4) |
| Al21$^{iii}$—Al12A—Al21$^{i}$ | 157.96 (11) | Ru8—Al26A—Ru9 | 125.89 (10) |
| Al12B$^{ii}$—Al12A—Al21$^{ii}$ | 67.5 (8) | Ru2—Al26A—Ru9 | 74.86 (4) |
| Al12B—Al12A—Al21$^{ii}$ | 127.4 (4) | Si26B—Al26A—Si6$^{xv}$ | 149.4 (4) |
| Al21$^{iii}$—Al12A—Al21$^{ii}$ | 100.34 (4) | Ru8—Al26A—Si6$^{xv}$ | 108.54 (8) |
| Al21$^{i}$—Al12A—Al21$^{ii}$ | 75.37 (3) | Ru2—Al26A—Si6$^{xv}$ | 107.54 (11) |
| Al12B$^{ii}$—Al12A—Al21 | 127.4 (4) | Ru9—Al26A—Si6$^{xv}$ | 107.90 (18) |
| Al12B—Al12A—Al21 | 67.5 (8) | Si26B—Al26A—Al17A$^{xx}$ | 92.8 (4) |
| Al21$^{iii}$—Al12A—Al21 | 75.37 (3) | Ru8—Al26A—Al17A$^{xx}$ | 66.69 (7) |
| Al21$^{i}$—Al12A—Al21 | 100.34 (4) | Ru2—Al26A—Al17A$^{xx}$ | 134.59 (9) |
| Al21$^{ii}$—Al12A—Al21 | 157.96 (11) | Ru9—Al26A—Al17A$^{xx}$ | 65.89 (6) |
| Al12B$^{ii}$—Al12A—Ru2$^{i}$ | 71.4 (7) | Si6$^{xv}$—Al26A—Al17A$^{xx}$ | 105.56 (15) |
| Al12B—Al12A—Ru2$^{i}$ | 71.4 (7) | Si26B—Al26A—Al20 | 12.3 (4) |
| Al21$^{iii}$—Al12A—Ru2$^{i}$ | 138.44 (5) | Ru8—Al26A—Al20 | 66.65 (14) |
| Al21$^{i}$—Al12A—Ru2$^{i}$ | 57.296 (18) | Ru2—Al26A—Al20 | 61.85 (11) |
| Al21$^{ii}$—Al12A—Ru2$^{i}$ | 57.296 (18) | Ru9—Al26A—Al20 | 101.79 (13) |
| Al21—Al12A—Ru2$^{i}$ | 138.44 (5) | Si6$^{xv}$—Al26A—Al20 | 144.43 (8) |
| Al12B$^{ii}$—Al12A—Ru2 | 71.4 (7) | Al17A$^{xx}$—Al26A—Al20 | 104.15 (16) |
| Al12B—Al12A—Ru2 | 71.4 (7) | Si26B—Al26A—Ru8$^{xviii}$ | 63.8 (4) |
| Al21$^{iii}$—Al12A—Ru2 | 57.297 (18) | Ru8—Al26A—Ru8$^{xviii}$ | 7.31 (7) |
| Al21$^{i}$—Al12A—Ru2 | 138.44 (5) | Ru2—Al26A—Ru8$^{xviii}$ | 134.7 (2) |
| Al21$^{ii}$—Al12A—Ru2 | 138.44 (5) | Ru9—Al26A—Ru8$^{xviii}$ | 126.28 (8) |
| Al21—Al12A—Ru2 | 57.298 (18) | Si6$^{xv}$—Al26A—Ru8$^{xviii}$ | 102.45 (8) |
| Ru2$^{i}$—Al12A—Ru2 | 114.07 (9) | Al17A$^{xx}$—Al26A—Ru8$^{xviii}$ | 63.79 (7) |
| Al12B$^{ii}$—Al12A—Al20 | 72.2 (15) | Al20—Al26A—Ru8$^{xviii}$ | 73.95 (14) |
| Al12B—Al12A—Al20 | 35.9 (15) | Si26B—Al26A—Al21 | 100.9 (4) |
| Al21$^{iii}$—Al12A—Al20 | 111.84 (7) | Ru8—Al26A—Al21 | 115.23 (8) |
| Al21$^{i}$—Al12A—Al20 | 89.50 (5) | Ru2—Al26A—Al21 | 57.85 (3) |
| Al21$^{ii}$—Al12A—Al20 | 111.84 (7) | Ru9—Al26A—Al21 | 117.54 (9) |
| Al21—Al12A—Al20 | 89.50 (5) | Si6$^{xv}$—Al26A—Al21 | 58.88 (8) |
| Ru2$^{i}$—Al12A—Al20 | 58.86 (4) | Al17A$^{xx}$—Al26A—Al21 | 164.4 (2) |
| Ru2—Al12A—Al20 | 58.86 (4) | Al20—Al26A—Al21 | 90.24 (11) |

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| Al12B$^{ii}$—Al12A—Al20$^{ii}$ | 35.9 (15) | Ru8$^{xviii}$—Al26A—Al21 | 116.01 (7) |
| Al12B—Al12A—Al20$^{ii}$ | 72.2 (15) | Si26B—Al26A—Al26A$^{xix}$ | 117.3 (4) |
| Al21$^{iii}$—Al12A—Al20$^{ii}$ | 89.50 (5) | Ru8—Al26A—Al26A$^{xix}$ | 60.96 (12) |
| Al21$^{i}$—Al12A—Al20$^{ii}$ | 111.84 (7) | Ru2—Al26A—Al26A$^{xix}$ | 165.22 (9) |
| Al21$^{ii}$—Al12A—Al20$^{ii}$ | 89.50 (5) | Ru9—Al26A—Al26A$^{xix}$ | 110.82 (8) |
| Al21—Al12A—Al20$^{ii}$ | 111.84 (7) | Si6$^{xv}$—Al26A—Al26A$^{xix}$ | 57.95 (3) |
| Ru2$^{i}$—Al12A—Al20$^{ii}$ | 58.86 (4) | Al17A$^{xx}$—Al26A—Al26A$^{xix}$ | 58.02 (7) |
| Ru2—Al12A—Al20$^{ii}$ | 58.86 (4) | Al20—Al26A—Al26A$^{xix}$ | 127.49 (5) |
| Al20—Al12A—Al20$^{ii}$ | 36.28 (10) | Ru8$^{xviii}$—Al26A—Al26A$^{xix}$ | 53.64 (11) |
| Al12B$^{ii}$—Al12A—Ru7A | 176.6 (15) | Al21—Al26A—Al26A$^{xix}$ | 108.38 (7) |
| Al12B—Al12A—Ru7A | 75.3 (15) | Al26A—Si26B—Al20 | 164.8 (5) |
| Al21$^{iii}$—Al12A—Ru7A | 110.57 (6) | Al26A—Si26B—Ru8 | 112.4 (4) |
| Al21$^{i}$—Al12A—Ru7A | 53.57 (3) | Al20—Si26B—Ru8 | 80.0 (2) |
| Al21$^{ii}$—Al12A—Ru7A | 110.57 (6) | Al26A—Si26B—Ru2 | 95.3 (4) |
| Al21—Al12A—Ru7A | 53.57 (3) | Al20—Si26B—Ru2 | 70.59 (14) |
| Ru2$^{i}$—Al12A—Ru7A | 110.196 (14) | Ru8—Si26B—Ru2 | 148.4 (3) |
| Ru2—Al12A—Ru7A | 110.197 (14) | Al26A—Si26B—Ru8$^{xviii}$ | 105.6 (4) |
| Al20—Al12A—Ru7A | 111.24 (6) | Al20—Si26B—Ru8$^{xviii}$ | 86.8 (2) |
| Al20$^{ii}$—Al12A—Ru7A | 147.52 (8) | Ru8—Si26B—Ru8$^{xviii}$ | 6.87 (7) |
| Al12A—Al12B—Al12B$^{ii}$ | 36.0 (15) | Ru2—Si26B—Ru8$^{xviii}$ | 154.5 (3) |
| Al12A—Al12B—Al20 | 133 (2) | Al26A—Si26B—Al17A$^{xx}$ | 76.3 (4) |
| Al12B$^{ii}$—Al12B—Al20 | 96.6 (7) | Al20—Si26B—Al17A$^{xx}$ | 117.6 (2) |
| Al12A—Al12B—Al21$^{i}$ | 96.1 (10) | Ru8—Si26B—Al17A$^{xx}$ | 68.57 (8) |
| Al12B$^{ii}$—Al12B—Al21$^{i}$ | 114.2 (6) | Ru2—Si26B—Al17A$^{xx}$ | 135.85 (12) |
| Al20—Al12B—Al21$^{i}$ | 109.6 (8) | Ru8$^{xviii}$—Si26B—Al17A$^{xx}$ | 65.16 (8) |
| Al12A—Al12B—Al21 | 96.1 (10) | Al26A—Si26B—Ru9 | 67.6 (4) |
| Al12B$^{ii}$—Al12B—Al21 | 114.2 (6) | Al20—Si26B—Ru9 | 111.86 (15) |
| Al20—Al12B—Al21 | 109.6 (8) | Ru8—Si26B—Ru9 | 129.86 (10) |
| Al21$^{i}$—Al12B—Al21 | 111.5 (8) | Ru2—Si26B—Ru9 | 73.78 (8) |
| Al12A—Al12B—Ru2$^{i}$ | 92.4 (10) | Ru8$^{xviii}$—Si26B—Ru9 | 127.65 (10) |
| Al12B$^{ii}$—Al12B—Ru2$^{i}$ | 76.2 (6) | Al17A$^{xx}$—Si26B—Ru9 | 62.85 (9) |
| Al20—Al12B—Ru2$^{i}$ | 68.2 (5) | Al26A—Si26B—Si13 | 117.4 (4) |
| Al21$^{i}$—Al12B—Ru2$^{i}$ | 61.39 (6) | Al20—Si26B—Si13 | 59.77 (13) |
| Al21—Al12B—Ru2$^{i}$ | 169.5 (12) | Ru8—Si26B—Si13 | 117.9 (2) |
| Al12A—Al12B—Ru2 | 92.4 (10) | Ru2—Si26B—Si13 | 55.64 (7) |
| Al12B$^{ii}$—Al12B—Ru2 | 76.2 (6) | Ru8$^{xviii}$—Si26B—Si13 | 122.8 (2) |
| Al20—Al12B—Ru2 | 68.2 (5) | Al17A$^{xx}$—Si26B—Si13 | 89.50 (8) |
| Al21$^{i}$—Al12B—Ru2 | 169.5 (12) | Ru9—Si26B—Si13 | 52.12 (5) |
| Al21—Al12B—Ru2 | 61.39 (6) | Al26A—Si26B—Al21 | 69.0 (4) |
| Ru2$^{i}$—Al12B—Ru2 | 124.4 (8) | Al20—Si26B—Al21 | 97.72 (13) |
| Al12A—Al12B—Al20$^{ii}$ | 92.1 (17) | Ru8—Si26B—Al21 | 118.41 (9) |
| Al12B$^{ii}$—Al12B—Al20$^{ii}$ | 56.1 (6) | Ru2—Si26B—Al21 | 56.84 (6) |
| Al20—Al12B—Al20$^{ii}$ | 40.5 (3) | Ru8$^{xviii}$—Si26B—Al21 | 117.29 (9) |
| Al21$^{i}$—Al12B—Al20$^{ii}$ | 123.3 (4) | Al17A$^{xx}$—Si26B—Al21 | 144.5 (3) |
| Al21—Al12B—Al20$^{ii}$ | 123.3 (4) | Ru9—Si26B—Al21 | 108.29 (15) |
| Ru2$^{i}$—Al12B—Al20$^{ii}$ | 62.3 (4) | Si13—Si26B—Al21 | 112.48 (9) |
| Ru2—Al12B—Al20$^{ii}$ | 62.3 (4) | Al26A—Si26B—Al12B | 119.2 (5) |
| Al12A—Al12B—Ru7A | 89.5 (16) | Al20—Si26B—Al12B | 48.4 (3) |

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| Al12B$^{ii}$—Al12B—Ru7A | 125.5 (6) | Ru8—Si26B—Al12B | 96.0 (4) |
| Al20—Al12B—Ru7A | 138.0 (12) | Ru2—Si26B—Al12B | 55.7 (4) |
| Al21$^{i}$—Al12B—Ru7A | 56.5 (4) | Ru8$^{xviii}$—Si26B—Al12B | 100.4 (4) |
| Al21—Al12B—Ru7A | 56.5 (4) | Al17A$^{xx}$—Si26B—Al12B | 162.3 (4) |
| Ru2$^{i}$—Al12B—Ru7A | 117.7 (4) | Ru9—Si26B—Al12B | 129.1 (4) |
| Ru2—Al12B—Ru7A | 117.7 (4) | Si13—Si26B—Al12B | 90.3 (4) |
| Al20$^{ii}$—Al12B—Ru7A | 178.5 (12) | Al21—Si26B—Al12B | 50.2 (3) |
| Al12A—Al12B—Si26B$^{i}$ | 144.6 (7) | Al28C$^{i}$—Al27—Al28C$^{xxiv}$ | 180 (3) |
| Al12B$^{ii}$—Al12B—Si26B$^{i}$ | 123.9 (4) | Al28C$^{i}$—Al27—Al28B$^{i}$ | 8.0 (11) |
| Al20—Al12B—Si26B$^{i}$ | 47.2 (5) | Al28C$^{xxiv}$—Al27—Al28B$^{i}$ | 172.0 (11) |
| Al21$^{i}$—Al12B—Si26B$^{i}$ | 63.5 (4) | Al28C$^{i}$—Al27—Al28B$^{xxiv}$ | 172.0 (11) |
| Al21—Al12B—Si26B$^{i}$ | 117.8 (10) | Al28C$^{xxiv}$—Al27—Al28B$^{xxiv}$ | 8.0 (11) |
| Ru2$^{i}$—Al12B—Si26B$^{i}$ | 52.9 (3) | Al28B$^{i}$—Al27—Al28B$^{xxiv}$ | 180.0 (13) |
| Ru2—Al12B—Si26B$^{i}$ | 111.9 (9) | Al28C$^{i}$—Al27—Ru5$^{xxviii}$ | 106.3 (11) |
| Al20$^{ii}$—Al12B—Si26B$^{i}$ | 78.3 (6) | Al28C$^{xxiv}$—Al27—Ru5$^{xxviii}$ | 73.7 (11) |
| Ru7A—Al12B—Si26B$^{i}$ | 100.5 (7) | Al28B$^{i}$—Al27—Ru5$^{xxviii}$ | 114.3 (5) |
| Al12A—Al12B—Si26B | 144.6 (7) | Al28B$^{xxiv}$—Al27—Ru5$^{xxviii}$ | 65.7 (5) |
| Al12B$^{ii}$—Al12B—Si26B | 123.9 (4) | Al28C$^{i}$—Al27—Ru5 | 73.7 (11) |
| Al20—Al12B—Si26B | 47.2 (5) | Al28C$^{xxiv}$—Al27—Ru5 | 106.3 (11) |
| Al21$^{i}$—Al12B—Si26B | 117.8 (10) | Al28B$^{i}$—Al27—Ru5 | 65.7 (5) |
| Al21—Al12B—Si26B | 63.5 (4) | Al28B$^{xxiv}$—Al27—Ru5 | 114.3 (5) |
| Ru2$^{i}$—Al12B—Si26B | 111.9 (9) | Ru5$^{xxviii}$—Al27—Ru5 | 180.0 |
| Ru2—Al12B—Si26B | 52.9 (3) | Al28C$^{i}$—Al27—Al23$^{xxviii}$ | 101.3 (5) |
| Al20$^{ii}$—Al12B—Si26B | 78.3 (6) | Al28C$^{xxiv}$—Al27—Al23$^{xxviii}$ | 78.7 (5) |
| Ru7A—Al12B—Si26B | 100.5 (7) | Al28B$^{i}$—Al27—Al23$^{xxviii}$ | 105.0 (2) |
| Si26B$^{i}$—Al12B—Si26B | 67.0 (6) | Al28B$^{xxiv}$—Al27—Al23$^{xxviii}$ | 75.0 (2) |
| Ru9—Si13—Ru9$^{iii}$ | 79.25 (3) | Ru5$^{xxviii}$—Al27—Al23$^{xxviii}$ | 59.495 (14) |
| Ru9—Si13—Ru1 | 133.97 (2) | Ru5—Al27—Al23$^{xxviii}$ | 120.505 (14) |
| Ru9$^{iii}$—Si13—Ru1 | 133.97 (2) | Al28C$^{i}$—Al27—Al23$^{iii}$ | 78.7 (5) |
| Ru9—Si13—Ru2 | 78.47 (2) | Al28C$^{xxiv}$—Al27—Al23$^{iii}$ | 101.3 (5) |
| Ru9$^{iii}$—Si13—Ru2 | 78.46 (2) | Al28B$^{i}$—Al27—Al23$^{iii}$ | 75.0 (2) |
| Ru1—Si13—Ru2 | 130.71 (4) | Al28B$^{xxiv}$—Al27—Al23$^{iii}$ | 105.0 (2) |
| Ru9—Si13—Al20$^{ii}$ | 138.45 (5) | Ru5$^{xxviii}$—Al27—Al23$^{iii}$ | 120.505 (14) |
| Ru9$^{iii}$—Si13—Al20$^{ii}$ | 108.59 (4) | Ru5—Al27—Al23$^{iii}$ | 59.495 (14) |
| Ru1—Si13—Al20$^{ii}$ | 69.62 (4) | Al23$^{xxviii}$—Al27—Al23$^{iii}$ | 61.41 (3) |
| Ru2—Si13—Al20$^{ii}$ | 64.15 (4) | Al28C$^{i}$—Al27—Al23$^{xxiii}$ | 101.3 (5) |
| Ru9—Si13—Al20 | 108.59 (4) | Al28C$^{xxiv}$—Al27—Al23$^{xxiii}$ | 78.7 (5) |
| Ru9$^{iii}$—Si13—Al20 | 138.44 (5) | Al28B$^{i}$—Al27—Al23$^{xxiii}$ | 105.0 (2) |
| Ru1—Si13—Al20 | 69.62 (4) | Al28B$^{xxiv}$—Al27—Al23$^{xxiii}$ | 75.0 (2) |
| Ru2—Si13—Al20 | 64.15 (4) | Ru5$^{xxviii}$—Al27—Al23$^{xxiii}$ | 59.495 (14) |
| Al20$^{ii}$—Si13—Al20 | 39.36 (10) | Ru5—Al27—Al23$^{xxiii}$ | 120.505 (14) |
| Ru9—Si13—Al25 | 68.38 (3) | Al23$^{xxviii}$—Al27—Al23$^{xxiii}$ | 118.59 (3) |
| Ru9$^{iii}$—Si13—Al25 | 109.91 (4) | Al23$^{iii}$—Al27—Al23$^{xxiii}$ | 180.00 (4) |
| Ru1—Si13—Al25 | 69.91 (3) | Al28C$^{i}$—Al27—Al23 | 78.7 (5) |
| Ru2—Si13—Al25 | 142.93 (3) | Al28C$^{xxiv}$—Al27—Al23 | 101.3 (5) |
| Al20$^{ii}$—Si13—Al25 | 136.87 (5) | Al28B$^{i}$—Al27—Al23 | 75.0 (2) |
| Al20—Si13—Al25 | 110.82 (5) | Al28B$^{xxiv}$—Al27—Al23 | 105.0 (2) |
| Ru9—Si13—Al25$^{iii}$ | 109.91 (4) | Ru5$^{xxviii}$—Al27—Al23 | 120.505 (14) |

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| Ru9$^{iii}$—Si13—Al25$^{iii}$ | 68.38 (3) | Ru5—Al27—Al23 | 59.495 (14) |
| Ru1—Si13—Al25$^{iii}$ | 69.91 (3) | Al23$^{xxviii}$—Al27—Al23 | 180.0 |
| Ru2—Si13—Al25$^{iii}$ | 142.93 (3) | Al23$^{iii}$—Al27—Al23 | 118.59 (3) |
| Al20$^{ii}$—Si13—Al25$^{iii}$ | 110.82 (5) | Al23$^{xxiii}$—Al27—Al23 | 61.41 (3) |
| Al20—Si13—Al25$^{iii}$ | 136.87 (5) | Al28C$^{i}$—Al27—Al28A$^{i}$ | 18.1 (10) |
| Al25—Si13—Al25$^{iii}$ | 67.53 (4) | Al28C$^{xxiv}$—Al27—Al28A$^{i}$ | 161.9 (10) |
| Ru9—Si13—Si26B | 61.75 (12) | Al28B$^{i}$—Al27—Al28A$^{i}$ | 11.3 (4) |
| Ru9$^{iii}$—Si13—Si26B | 122.39 (11) | Al28B$^{xxiv}$—Al27—Al28A$^{i}$ | 168.7 (4) |
| Ru1—Si13—Si26B | 103.17 (11) | Ru5$^{xxviii}$—Al27—Al28A$^{i}$ | 122.36 (4) |
| Ru2—Si13—Si26B | 54.62 (6) | Ru5—Al27—Al28A$^{i}$ | 57.64 (4) |
| Al20$^{ii}$—Si13—Si26B | 81.32 (11) | Al23$^{xxviii}$—Al27—Al28A$^{i}$ | 115.61 (5) |
| Al20—Si13—Si26B | 46.86 (13) | Al23$^{iii}$—Al27—Al28A$^{i}$ | 78.24 (5) |
| Al25—Si13—Si26B | 93.92 (6) | Al23$^{xxiii}$—Al27—Al28A$^{i}$ | 101.76 (5) |
| Al25$^{iii}$—Si13—Si26B | 161.39 (6) | Al23—Al27—Al28A$^{i}$ | 64.39 (5) |
| Ru9—Si13—Si26B$^{iii}$ | 122.39 (11) | Al28C$^{i}$—Al27—Al28A$^{xxiv}$ | 161.9 (10) |
| Ru9$^{iii}$—Si13—Si26B$^{iii}$ | 61.75 (12) | Al28C$^{xxiv}$—Al27—Al28A$^{xxiv}$ | 18.1 (10) |
| Ru1—Si13—Si26B$^{iii}$ | 103.17 (11) | Al28B$^{i}$—Al27—Al28A$^{xxiv}$ | 168.7 (4) |
| Ru2—Si13—Si26B$^{iii}$ | 54.62 (6) | Al28B$^{xxiv}$—Al27—Al28A$^{xxiv}$ | 11.3 (4) |
| Al20$^{ii}$—Si13—Si26B$^{iii}$ | 46.86 (13) | Ru5$^{xxviii}$—Al27—Al28A$^{xxiv}$ | 57.64 (4) |
| Al20—Si13—Si26B$^{iii}$ | 81.32 (11) | Ru5—Al27—Al28A$^{xxiv}$ | 122.36 (4) |
| Al25—Si13—Si26B$^{iii}$ | 161.40 (6) | Al23$^{xxviii}$—Al27—Al28A$^{xxiv}$ | 64.39 (5) |
| Al25$^{iii}$—Si13—Si26B$^{iii}$ | 93.93 (6) | Al23$^{iii}$—Al27—Al28A$^{xxiv}$ | 101.76 (5) |
| Si26B—Si13—Si26B$^{iii}$ | 104.56 (11) | Al23$^{xxiii}$—Al27—Al28A$^{xxiv}$ | 78.24 (5) |
| Ru9—Al14—Ru9$^{iii}$ | 74.75 (2) | Al23—Al27—Al28A$^{xxiv}$ | 115.61 (5) |
| Ru9—Al14—Ru4 | 128.03 (3) | Al28A$^{i}$—Al27—Al28A$^{xxiv}$ | 180.00 (7) |
| Ru9$^{iii}$—Al14—Ru4 | 128.03 (3) | Al28A$^{iii}$—Al28A—Al28B | 67.3 (6) |
| Ru9—Al14—Si6$^{xii}$ | 107.23 (3) | Al28A$^{iii}$—Al28A—Al28C | 76.1 (3) |
| Ru9$^{iii}$—Al14—Si6$^{xii}$ | 107.23 (3) | Al28B—Al28A—Al28C | 9.6 (7) |
| Ru4—Al14—Si6$^{xii}$ | 107.28 (4) | Al28A$^{iii}$—Al28A—Si17B | 79.04 (15) |
| Ru9—Al14—Al25 | 65.59 (2) | Al28B—Al28A—Si17B | 133.7 (9) |
| Ru9$^{iii}$—Al14—Al25 | 104.13 (4) | Al28C—Al28A—Si17B | 142.3 (8) |
| Ru4—Al14—Al25 | 63.62 (3) | Al28A$^{iii}$—Al28A—Ru5$^{i}$ | 81.43 (6) |
| Si6$^{xii}$—Al14—Al25 | 144.44 (3) | Al28B—Al28A—Ru5$^{i}$ | 68.4 (9) |
| Ru9—Al14—Al25$^{iii}$ | 104.13 (4) | Al28C—Al28A—Ru5$^{i}$ | 65.1 (8) |
| Ru9$^{iii}$—Al14—Al25$^{iii}$ | 65.60 (2) | Si17B—Al28A—Ru5$^{i}$ | 137.7 (4) |
| Ru4—Al14—Al25$^{iii}$ | 63.62 (3) | Al28A$^{iii}$—Al28A—Al17A | 81.59 (5) |
| Si6$^{xii}$—Al14—Al25$^{iii}$ | 144.44 (3) | Al28B—Al28A—Al17A | 132.4 (9) |
| Al25—Al14—Al25$^{iii}$ | 65.56 (5) | Al28C—Al28A—Al17A | 140.4 (8) |
| Ru9—Al14—Al23$^{ix}$ | 110.764 (16) | Si17B—Al28A—Al17A | 5.0 (4) |
| Ru9$^{iii}$—Al14—Al23$^{ix}$ | 168.52 (4) | Ru5$^{i}$—Al28A—Al17A | 142.71 (9) |
| Ru4—Al14—Al23$^{ix}$ | 57.15 (2) | Al28A$^{iii}$—Al28A—Al25$^{v}$ | 140.30 (5) |
| Si6$^{xii}$—Al14—Al23$^{ix}$ | 61.80 (3) | Al28B—Al28A—Al25$^{v}$ | 113.0 (7) |
| Al25—Al14—Al23$^{ix}$ | 87.35 (3) | Al28C—Al28A—Al25$^{v}$ | 108.9 (6) |
| Al25$^{iii}$—Al14—Al23$^{ix}$ | 120.77 (4) | Si17B—Al28A—Al25$^{v}$ | 74.4 (3) |
| Ru9—Al14—Al23$^{viii}$ | 168.52 (4) | Ru5$^{i}$—Al28A—Al25$^{v}$ | 137.33 (10) |
| Ru9$^{iii}$—Al14—Al23$^{viii}$ | 110.764 (16) | Al17A—Al28A—Al25$^{v}$ | 70.04 (6) |
| Ru4—Al14—Al23$^{viii}$ | 57.15 (2) | Al28A$^{iii}$—Al28A—Ru3 | 81.66 (5) |
| Si6$^{xii}$—Al14—Al23$^{viii}$ | 61.80 (3) | Al28B—Al28A—Ru3 | 80.5 (9) |

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| Al25—Al14—Al23$^{viii}$ | 120.77 (4) | Al28C—Al28A—Ru3 | 85.1 (9) |
| Al25$^{iii}$—Al14—Al23$^{viii}$ | 87.35 (3) | Si17B—Al28A—Ru3 | 63.5 (4) |
| Al23$^{ix}$—Al14—Al23$^{viii}$ | 62.02 (4) | Ru5$^{i}$—Al28A—Ru3 | 148.43 (9) |
| Ru9—Al14—Al15$^{i}$ | 58.96 (2) | Al17A—Al28A—Ru3 | 59.38 (5) |
| Ru9$^{iii}$—Al14—Al15$^{i}$ | 58.95 (2) | Al25$^{v}$—Al28A—Ru3 | 60.26 (5) |
| Ru4—Al14—Al15$^{i}$ | 169.63 (4) | Al28A$^{iii}$—Al28A—Al22$^{i}$ | 113.62 (5) |
| Si6$^{xii}$—Al14—Al15$^{i}$ | 62.36 (3) | Al28B—Al28A—Al22$^{i}$ | 127.4 (10) |
| Al25—Al14—Al15$^{i}$ | 124.44 (3) | Al28C—Al28A—Al22$^{i}$ | 121.4 (8) |
| Al25$^{iii}$—Al14—Al15$^{i}$ | 124.44 (3) | Si17B—Al28A—Al22$^{i}$ | 94.4 (3) |
| Al23$^{ix}$—Al14—Al15$^{i}$ | 114.47 (4) | Ru5$^{i}$—Al28A—Al22$^{i}$ | 60.36 (4) |
| Al23$^{viii}$—Al14—Al15$^{i}$ | 114.46 (4) | Al17A—Al28A—Al22$^{i}$ | 97.35 (7) |
| Ru9—Al14—Al22$^{viii}$ | 115.76 (3) | Al25$^{v}$—Al28A—Al22$^{i}$ | 97.47 (8) |
| Ru9$^{iii}$—Al14—Al22$^{viii}$ | 55.318 (17) | Ru3—Al28A—Al22$^{i}$ | 151.18 (9) |
| Ru4—Al14—Al22$^{viii}$ | 114.64 (2) | Al28A$^{iii}$—Al28A—Al27$^{xxix}$ | 82.37 (5) |
| Si6$^{xii}$—Al14—Al22$^{viii}$ | 61.01 (2) | Al28B—Al28A—Al27$^{xxix}$ | 23.5 (9) |
| Al25—Al14—Al22$^{viii}$ | 154.49 (4) | Al28C—Al28A—Al27$^{xxix}$ | 15.9 (8) |
| Al25$^{iii}$—Al14—Al22$^{viii}$ | 90.42 (3) | Si17B—Al28A—Al27$^{xxix}$ | 157.0 (2) |
| Al23$^{ix}$—Al14—Al22$^{viii}$ | 113.65 (4) | Ru5$^{i}$—Al28A—Al27$^{xxix}$ | 50.81 (4) |
| Al23$^{viii}$—Al14—Al22$^{viii}$ | 63.22 (2) | Al17A—Al28A—Al27$^{xxix}$ | 155.92 (9) |
| Al15$^{i}$—Al14—Al22$^{viii}$ | 61.44 (2) | Al25$^{v}$—Al28A—Al27$^{xxix}$ | 113.47 (8) |
| Ru9—Al14—Al22$^{ix}$ | 55.319 (17) | Ru3—Al28A—Al27$^{xxix}$ | 100.54 (6) |
| Ru9$^{iii}$—Al14—Al22$^{ix}$ | 115.76 (3) | Al22$^{i}$—Al28A—Al27$^{xxix}$ | 105.50 (6) |
| Ru4—Al14—Al22$^{ix}$ | 114.64 (2) | Al28C—Al28B—Al28A | 155.5 (14) |
| Si6$^{xii}$—Al14—Al22$^{ix}$ | 61.01 (2) | Al28C—Al28B—Al28A$^{iii}$ | 155.5 (14) |
| Al25—Al14—Al22$^{ix}$ | 90.42 (3) | Al28A—Al28B—Al28A$^{iii}$ | 45.5 (13) |
| Al25$^{iii}$—Al14—Al22$^{ix}$ | 154.49 (4) | Al28C—Al28B—Al27$^{xxix}$ | 18 (2) |
| Al23$^{ix}$—Al14—Al22$^{ix}$ | 63.22 (2) | Al28A—Al28B—Al27$^{xxix}$ | 145.2 (11) |
| Al23$^{viii}$—Al14—Al22$^{ix}$ | 113.65 (4) | Al28A$^{iii}$—Al28B—Al27$^{xxix}$ | 145.2 (11) |
| Al15$^{i}$—Al14—Al22$^{ix}$ | 61.44 (2) | Al28C—Al28B—Ru5$^{i}$ | 82 (3) |
| Al22$^{viii}$—Al14—Al22$^{ix}$ | 111.52 (4) | Al28A—Al28B—Ru5$^{i}$ | 88.9 (10) |
| Si17B—Al15—Ru9$^{iv}$ | 63.07 (3) | Al28A$^{iii}$—Al28B—Ru5$^{i}$ | 88.9 (10) |
| Si17B—Al15—Ru9$^{v}$ | 63.07 (3) | Al27$^{xxix}$—Al28B—Ru5$^{i}$ | 64.0 (6) |
| Ru9$^{iv}$—Al15—Ru9$^{v}$ | 125.94 (4) | Al28C—Al28B—Ru3 | 112 (3) |
| Si17B—Al15—Ru9$^{ii}$ | 132.0 (4) | Al28A—Al28B—Ru3 | 78.0 (11) |
| Ru9$^{iv}$—Al15—Ru9$^{ii}$ | 76.250 (11) | Al28A$^{iii}$—Al28B—Ru3 | 78.0 (11) |
| Ru9$^{v}$—Al15—Ru9$^{ii}$ | 144.13 (4) | Al27$^{xxix}$—Al28B—Ru3 | 130.2 (10) |
| Si17B—Al15—Ru9$^{i}$ | 132.0 (4) | Ru5$^{i}$—Al28B—Ru3 | 165.8 (12) |
| Ru9$^{iv}$—Al15—Ru9$^{i}$ | 144.13 (4) | Al28C—Al28B—Al24$^{v}$ | 66 (2) |
| Ru9$^{v}$—Al15—Ru9$^{i}$ | 76.250 (11) | Al28A—Al28B—Al24$^{v}$ | 106.4 (7) |
| Ru9$^{ii}$—Al15—Ru9$^{i}$ | 72.07 (3) | Al28A$^{iii}$—Al28B—Al24$^{v}$ | 133.2 (14) |
| Si17B—Al15—Al17A | 13.5 (5) | Al27$^{xxix}$—Al28B—Al24$^{v}$ | 80.8 (8) |
| Ru9$^{iv}$—Al15—Al17A | 64.43 (2) | Ru5$^{i}$—Al28B—Al24$^{v}$ | 133.1 (8) |
| Ru9$^{v}$—Al15—Al17A | 64.43 (2) | Ru3—Al28B—Al24$^{v}$ | 57.5 (3) |
| Ru9$^{ii}$—Al15—Al17A | 139.19 (3) | Al28C—Al28B—Al24$^{iv}$ | 66 (2) |
| Ru9$^{i}$—Al15—Al17A | 139.19 (3) | Al28A—Al28B—Al24$^{iv}$ | 133.2 (14) |
| Si17B—Al15—Al14$^{i}$ | 167.7 (6) | Al28A$^{iii}$—Al28B—Al24$^{iv}$ | 106.4 (7) |
| Ru9$^{iv}$—Al15—Al14$^{i}$ | 116.772 (19) | Al27$^{xxix}$—Al28B—Al24$^{iv}$ | 80.8 (8) |
| Ru9$^{v}$—Al15—Al14$^{i}$ | 116.772 (19) | Ru5$^{i}$—Al28B—Al24$^{iv}$ | 133.1 (8) |

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| Ru9$^{ii}$—Al15—Al14$^{i}$ | 56.12 (2) | Ru3—Al28B—Al24$^{iv}$ | 57.5 (3) |
| Ru9$^{i}$—Al15—Al14$^{i}$ | 56.12 (2) | Al24$^{v}$—Al28B—Al24$^{iv}$ | 62.9 (4) |
| Al17A—Al15—Al14$^{i}$ | 154.18 (7) | Al28C—Al28B—Si17B | 167 (3) |
| Si17B—Al15—Si6$^{xxvi}$ | 111.0 (6) | Al28A—Al28B—Si17B | 31.4 (8) |
| Ru9$^{iv}$—Al15—Si6$^{xxvi}$ | 101.37 (2) | Al28A$^{iii}$—Al28B—Si17B | 31.4 (8) |
| Ru9$^{v}$—Al15—Si6$^{xxvi}$ | 101.37 (2) | Al27$^{xxix}$—Al28B—Si17B | 175.2 (9) |
| Ru9$^{ii}$—Al15—Si6$^{xxvi}$ | 100.57 (3) | Ru5$^{i}$—Al28B—Si17B | 111.1 (9) |
| Ru9$^{i}$—Al15—Si6$^{xxvi}$ | 100.57 (3) | Ru3—Al28B—Si17B | 54.6 (6) |
| Al17A—Al15—Si6$^{xxvi}$ | 97.50 (6) | Al24$^{v}$—Al28B—Si17B | 103.3 (6) |
| Al14$^{i}$—Al15—Si6$^{xxvi}$ | 56.68 (3) | Al24$^{iv}$—Al28B—Si17B | 103.3 (6) |
| Si17B—Al15—Al22$^{ii}$ | 78.3 (5) | Al28C—Al28B—Al23$^{ii}$ | 74.0 (15) |
| Ru9$^{iv}$—Al15—Al22$^{ii}$ | 55.306 (19) | Al28A—Al28B—Al23$^{ii}$ | 119.0 (11) |
| Ru9$^{v}$—Al15—Al22$^{ii}$ | 108.83 (3) | Al28A$^{iii}$—Al28B—Al23$^{ii}$ | 82.0 (5) |
| Ru9$^{ii}$—Al15—Al22$^{ii}$ | 57.28 (2) | Al27$^{xxix}$—Al28B—Al23$^{ii}$ | 65.0 (4) |
| Ru9$^{i}$—Al15—Al22$^{ii}$ | 92.78 (3) | Ru5$^{i}$—Al28B—Al23$^{ii}$ | 56.2 (3) |
| Al17A—Al15—Al22$^{ii}$ | 89.97 (5) | Ru3—Al28B—Al23$^{ii}$ | 126.0 (3) |
| Al14$^{i}$—Al15—Al22$^{ii}$ | 112.18 (4) | Al24$^{v}$—Al28B—Al23$^{ii}$ | 134.4 (9) |
| Si6$^{xxvi}$—Al15—Al22$^{ii}$ | 149.13 (2) | Al24$^{iv}$—Al28B—Al23$^{ii}$ | 81.8 (3) |
| Si17B—Al15—Al22$^{i}$ | 78.3 (5) | Si17B—Al28B—Al23$^{ii}$ | 112.8 (6) |
| Ru9$^{iv}$—Al15—Al22$^{i}$ | 108.83 (3) | Al28C—Al28B—Al23$^{i}$ | 74.0 (15) |
| Ru9$^{v}$—Al15—Al22$^{i}$ | 55.306 (19) | Al28A—Al28B—Al23$^{i}$ | 82.0 (5) |
| Ru9$^{ii}$—Al15—Al22$^{i}$ | 92.78 (3) | Al28A$^{iii}$—Al28B—Al23$^{i}$ | 119.0 (11) |
| Ru9$^{i}$—Al15—Al22$^{i}$ | 57.28 (2) | Al27$^{xxix}$—Al28B—Al23$^{i}$ | 65.0 (4) |
| Al17A—Al15—Al22$^{i}$ | 89.97 (5) | Ru5$^{i}$—Al28B—Al23$^{i}$ | 56.2 (3) |
| Al14$^{i}$—Al15—Al22$^{i}$ | 112.18 (4) | Ru3—Al28B—Al23$^{i}$ | 126.0 (3) |
| Si6$^{xxvi}$—Al15—Al22$^{i}$ | 149.13 (2) | Al24$^{v}$—Al28B—Al23$^{i}$ | 81.8 (3) |
| Al22$^{ii}$—Al15—Al22$^{i}$ | 60.09 (3) | Al24$^{iv}$—Al28B—Al23$^{i}$ | 134.4 (9) |
| Si17B—Al15—Al22$^{v}$ | 114.0 (3) | Si17B—Al28B—Al23$^{i}$ | 112.8 (6) |
| Ru9$^{iv}$—Al15—Al22$^{v}$ | 159.05 (4) | Al23$^{ii}$—Al28B—Al23$^{i}$ | 107.6 (6) |
| Ru9$^{v}$—Al15—Al22$^{v}$ | 57.609 (15) | Al28B—Al28C—Al27$^{xxix}$ | 154 (4) |
| Ru9$^{ii}$—Al15—Al22$^{v}$ | 112.97 (3) | Al28B—Al28C—Al28A | 14.9 (8) |
| Ru9$^{i}$—Al15—Al22$^{v}$ | 54.534 (18) | Al27$^{xxix}$—Al28C—Al28A | 146.0 (16) |
| Al17A—Al15—Al22$^{v}$ | 107.73 (4) | Al28B—Al28C—Al28A$^{iii}$ | 14.9 (8) |
| Al14$^{i}$—Al15—Al22$^{v}$ | 61.21 (2) | Al27$^{xxix}$—Al28C—Al28A$^{iii}$ | 146.0 (16) |
| Si6$^{xxvi}$—Al15—Al22$^{v}$ | 59.21 (2) | Al28A—Al28C—Al28A$^{iii}$ | 27.7 (7) |
| Al22$^{ii}$—Al15—Al22$^{v}$ | 145.63 (3) | Al28B—Al28C—Ru5$^{i}$ | 83 (3) |
| Al22$^{i}$—Al15—Al22$^{v}$ | 89.97 (2) | Al27$^{xxix}$—Al28C—Ru5$^{i}$ | 71.5 (10) |
| Si17B—Al15—Al22$^{iv}$ | 114.0 (3) | Al28A—Al28C—Ru5$^{i}$ | 77.5 (11) |
| Ru9$^{iv}$—Al15—Al22$^{iv}$ | 57.609 (15) | Al28A$^{iii}$—Al28C—Ru5$^{i}$ | 77.5 (11) |
| Ru9$^{v}$—Al15—Al22$^{iv}$ | 159.05 (4) | Al28B—Al28C—Al24$^{v}$ | 101 (2) |
| Ru9$^{ii}$—Al15—Al22$^{iv}$ | 54.534 (18) | Al27$^{xxix}$—Al28C—Al24$^{v}$ | 100.7 (14) |
| Ru9$^{i}$—Al15—Al22$^{iv}$ | 112.97 (3) | Al28A—Al28C—Al24$^{v}$ | 96.8 (10) |
| Al17A—Al15—Al22$^{iv}$ | 107.73 (4) | Al28A$^{iii}$—Al28C—Al24$^{v}$ | 112.8 (14) |
| Al14$^{i}$—Al15—Al22$^{iv}$ | 61.21 (2) | Ru5$^{i}$—Al28C—Al24$^{v}$ | 145.4 (4) |
| Si6$^{xxvi}$—Al15—Al22$^{iv}$ | 59.21 (2) | Al28B—Al28C—Al24$^{iv}$ | 101 (2) |
| Al22$^{ii}$—Al15—Al22$^{iv}$ | 89.97 (2) | Al27$^{xxix}$—Al28C—Al24$^{iv}$ | 100.7 (14) |
| Al22$^{i}$—Al15—Al22$^{iv}$ | 145.63 (3) | Al28A—Al28C—Al24$^{iv}$ | 112.8 (14) |
| Al22$^{v}$—Al15—Al22$^{iv}$ | 111.16 (4) | Al28A$^{iii}$—Al28C—Al24$^{iv}$ | 96.8 (10) |

| | | | |
|---|---|---|---|
| Ru7B$^{xxv}$—Al16—Ru7B$^{xi}$ | 77.0 (6) | Ru5$^{i}$—Al28C—Al24$^{iv}$ | 145.4 (4) |
| Ru7B$^{xxv}$—Al16—Ru4 | 136.1 (2) | Al24$^{v}$—Al28C—Al24$^{iv}$ | 68.4 (6) |
| Ru7B$^{xi}$—Al16—Ru4 | 136.1 (2) | Al28B—Al28C—Al28C$^{vi}$ | 154 (4) |
| Ru7B$^{xxv}$—Al16—Ru7A$^{xxv}$ | 4.1 (4) | Al27$^{xxix}$—Al28C—Al28C$^{vi}$ | 0.0 (8) |
| Ru7B$^{xi}$—Al16—Ru7A$^{xxv}$ | 79.3 (3) | Al28A—Al28C—Al28C$^{vi}$ | 146.0 (16) |
| Ru4—Al16—Ru7A$^{xxv}$ | 135.94 (4) | Al28A$^{iii}$—Al28C—Al28C$^{vi}$ | 146.0 (16) |
| Ru7B$^{xxv}$—Al16—Ru7A$^{xi}$ | 79.3 (3) | Ru5$^{i}$—Al28C—Al28C$^{vi}$ | 71.5 (10) |
| Ru7B$^{xi}$—Al16—Ru7A$^{xi}$ | 4.1 (4) | Al24$^{v}$—Al28C—Al28C$^{vi}$ | 100.7 (14) |
| Ru4—Al16—Ru7A$^{xi}$ | 135.94 (4) | Al24$^{iv}$—Al28C—Al28C$^{vi}$ | 100.7 (14) |
| Ru7A$^{xxv}$—Al16—Ru7A$^{xi}$ | 81.43 (11) | Al28B—Al28C—Al23$^{ii}$ | 93.7 (16) |
| Ru7B$^{xxv}$—Al16—Al24 | 70.8 (3) | Al27$^{xxix}$—Al28C—Al23$^{ii}$ | 72.8 (7) |
| Ru7B$^{xi}$—Al16—Al24 | 144.9 (4) | Al28A—Al28C—Al23$^{ii}$ | 102.4 (11) |
| Ru4—Al16—Al24 | 67.90 (3) | Al28A$^{iii}$—Al28C—Al23$^{ii}$ | 79.2 (6) |
| Ru7A$^{xxv}$—Al16—Al24 | 69.37 (4) | Ru5$^{i}$—Al28C—Al23$^{ii}$ | 58.0 (4) |
| Ru7A$^{xi}$—Al16—Al24 | 148.30 (9) | Al24$^{v}$—Al28C—Al23$^{ii}$ | 153.6 (10) |
| Ru7B$^{xxv}$—Al16—Al24$^{iii}$ | 144.9 (4) | Al24$^{iv}$—Al28C—Al23$^{ii}$ | 87.4 (2) |
| Ru7B$^{xi}$—Al16—Al24$^{iii}$ | 70.8 (3) | Al28C$^{vi}$—Al28C—Al23$^{ii}$ | 72.8 (7) |
| Ru4—Al16—Al24$^{iii}$ | 67.90 (3) | Al28B—Al28C—Al23$^{i}$ | 93.7 (16) |
| Ru7A$^{xxv}$—Al16—Al24$^{iii}$ | 148.30 (9) | Al27$^{xxix}$—Al28C—Al23$^{i}$ | 72.8 (7) |
| Ru7A$^{xi}$—Al16—Al24$^{iii}$ | 69.37 (4) | Al28A—Al28C—Al23$^{i}$ | 79.2 (6) |
| Al24—Al16—Al24$^{iii}$ | 134.53 (5) | Al28A$^{iii}$—Al28C—Al23$^{i}$ | 102.4 (11) |
| Ru7B$^{xxv}$—Al16—Si6 | 101.2 (5) | Ru5$^{i}$—Al28C—Al23$^{i}$ | 58.0 (4) |
| Ru7B$^{xi}$—Al16—Si6 | 101.2 (5) | Al24$^{v}$—Al28C—Al23$^{i}$ | 87.4 (2) |
| Ru4—Al16—Si6 | 98.54 (4) | Al24$^{iv}$—Al28C—Al23$^{i}$ | 153.6 (10) |
| Ru7A$^{xxv}$—Al16—Si6 | 97.56 (9) | Al28C$^{vi}$—Al28C—Al23$^{i}$ | 72.8 (7) |
| Ru7A$^{xi}$—Al16—Si6 | 97.56 (9) | Al23$^{ii}$—Al28C—Al23$^{i}$ | 113.7 (8) |
| Al24—Al16—Si6 | 98.22 (3) | Al28B—Al28C—Ru3 | 56 (3) |
| Al24$^{iii}$—Al16—Si6 | 98.22 (3) | Al27$^{xxix}$—Al28C—Ru3 | 149.8 (17) |
| Ru7B$^{xxv}$—Al16—Al21$^{x}$ | 57.5 (5) | Al28A—Al28C—Ru3 | 62.5 (10) |
| Ru7B$^{xi}$—Al16—Al21$^{x}$ | 114.2 (3) | Al28A$^{iii}$—Al28C—Ru3 | 62.5 (10) |
| Ru4—Al16—Al21$^{x}$ | 109.03 (3) | Ru5$^{i}$—Al28C—Ru3 | 138.7 (15) |
| Ru7A$^{xxv}$—Al16—Al21$^{x}$ | 53.48 (9) | Al24$^{v}$—Al28C—Ru3 | 55.5 (5) |
| Ru7A$^{xi}$—Al16—Al21$^{x}$ | 113.39 (5) | Al24$^{iv}$—Al28C—Ru3 | 55.5 (5) |
| Al24—Al16—Al21$^{x}$ | 58.04 (2) | Al28C$^{vi}$—Al28C—Ru3 | 149.8 (17) |
| Al24$^{iii}$—Al16—Al21$^{x}$ | 150.87 (5) | Al23$^{ii}$—Al28C—Ru3 | 119.1 (7) |
| Si6—Al16—Al21$^{x}$ | 52.86 (3) | Al23$^{i}$—Al28C—Ru3 | 119.1 (7) |
| Ru7B$^{xxv}$—Al16—Al21$^{xi}$ | 114.2 (3) | Al28B—Al28C—Ru5$^{xxix}$ | 159 (3) |
| Ru7B$^{xi}$—Al16—Al21$^{xi}$ | 57.5 (5) | Al27$^{xxix}$—Al28C—Ru5$^{xxix}$ | 47.4 (10) |
| Ru4—Al16—Al21$^{xi}$ | 109.03 (3) | Al28A—Al28C—Ru5$^{xxix}$ | 158.9 (10) |
| Ru7A$^{xxv}$—Al16—Al21$^{xi}$ | 113.39 (5) | Al28A$^{iii}$—Al28C—Ru5$^{xxix}$ | 158.9 (10) |
| Ru7A$^{xi}$—Al16—Al21$^{xi}$ | 53.48 (9) | Ru5$^{i}$—Al28C—Ru5$^{xxix}$ | 118.9 (13) |
| Al24—Al16—Al21$^{xi}$ | 150.87 (5) | Al24$^{v}$—Al28C—Ru5$^{xxix}$ | 62.1 (7) |
| Al24$^{iii}$—Al16—Al21$^{xi}$ | 58.04 (2) | Al24$^{iv}$—Al28C—Ru5$^{xxix}$ | 62.1 (7) |
| Si6—Al16—Al21$^{xi}$ | 52.86 (3) | Al28C$^{vi}$—Al28C—Ru5$^{xxix}$ | 47.4 (10) |
| Al21$^{x}$—Al16—Al21$^{xi}$ | 99.01 (5) | Al23$^{ii}$—Al28C—Ru5$^{xxix}$ | 97.9 (8) |

| | | | |
|---|---|---|---|
| Si17B—Al17A—Ru3 | 74.0 (11) | Al23$^{i}$—Al28C—Ru5$^{xxix}$ | 97.9 (8) |
| Si17B—Al17A—Al28A$^{iii}$ | 16.0 (9) | Ru3—Al28C—Ru5$^{xxix}$ | 102.3 (7) |

Symmetry codes: (i) *x*, *y*, −*z*+1/2; (ii) −*x*, *y*, −*z*+1/2; (iii) −*x*, *y*, *z*; (iv) *x*−1/2, −*y*+1/2, *z*+1/2; (v) −*x*+1/2, −*y*+1/2, *z*+1/2; (vi) −*x*, −*y*, −*z*+1; (vii) −*x*+1/2, −*y*+1/2, −*z*+1; (viii) *x*−1/2, −*y*+1/2, −*z*; (ix) −*x*+1/2, −*y*+1/2, −*z*; (x) −*x*+1/2, *y*+1/2, *z*; (xi) *x*−1/2, *y*+1/2, *z*; (xii) −*x*, −*y*+1, −*z*; (xiii) −*x*, −*y*+1, *z*−1/2; (xiv) *x*+1/2, *y*−1/2, −*z*+1/2; (xv) *x*+1/2, *y*−1/2, *z*; (xvi) −*x*+1/2, *y*−1/2, −*z*+1/2; (xvii) −*x*+1/2, *y*−1/2, *z*; (xviii) −*x*+1, *y*, −*z*+1/2; (xix) −*x*+1, *y*, *z*; (xx) −*x*+1/2, −*y*+1/2, *z*−1/2; (xxi) *x*−1/2, *y*−1/2, *z*; (xxii) *x*−1/2, *y*−1/2, −*z*+1/2; (xxiii) *x*, −*y*, −*z*; (xxiv) −*x*, −*y*, *z*−1/2; (xxv) −*x*+1/2, *y*+1/2, −*z*+1/2; (xxvi) −*x*, −*y*+1, *z*+1/2; (xxvii) *x*+1/2, *y*+1/2, *z*; (xxviii) −*x*, −*y*, −*z*; (xxix) −*x*, −*y*, *z*+1/2.

## Docosaaluminium nonaruthenium decasilicon (II)

*Crystal data*

| | |
|---|---|
| ~$Ru_9(Al_{0.70}Si_{0.30})_{32}$ | $D_x$ = 4.777 Mg m$^{-3}$ |
| $M_r$ = 1783.65 | Mo $K\alpha$ radiation, $\lambda$ = 0.71073 Å |
| Trigonal, $R\bar{3}$ | Cell parameters from 10605 reflections |
| $a$ = 10.4479 (2) Å | $\theta$ = 3.9–30.7° |
| $c$ = 19.6774 (4) Å | $\mu$ = 6.59 mm$^{-1}$ |
| $V$ = 1860.17 (7) Å$^3$ | $T$ = 296 K |
| $Z$ = 3 | Irregular, metallic light silver |
| $F$(000) = 2436.84 | 0.03 × 0.03 × 0.03 mm |

*Data collection*

| | |
|---|---|
| XtaLAB Synergy R, HyPix diffractometer | $T_{min}$ = 0.868, $T_{max}$ = 0.879 |
| Radiation source: micro-focus sealed X-ray tube, Mova (Mo) X-ray Source | 14255 measured reflections |
| Mirror monochromator | 1193 independent reflections |
| Detector resolution: 10.0000 pixels mm$^{-1}$ | 1127 reflections with $I > 2\sigma(I)$ |
| $\omega$ scans | $R_{int}$ = 0.027 |
| Absorption correction: gaussian (CrysAlisPro; Matsumoto *et al.*, 2021) | $\theta_{max}$ = 30.8°, $\theta_{min}$ = 3.9° |
| | $h$ = −14→14 |
| | $k$ = −14→14 |
| | $l$ = −27→28 |

*Refinement*

| | |
|---|---|
| Refinement on $F^2$ | $w = 1/[\sigma^2(F_o^2) + (0.0111P)^2 + 0.5812P]$ where $P = (F_o^2 + 2F_c^2)/3$ |
| Least-squares matrix: full | $(\Delta/\sigma)_{max}$ = 0.002 |
| $R[F^2 > 2\sigma(F^2)]$ = 0.013 | $\Delta\rho_{max}$ = 0.45 e Å$^{-3}$ |
| $wR(F^2)$ = 0.024 | $\Delta\rho_{min}$ = −0.53 e Å$^{-3}$ |
| $S$ = 1.08 | Extinction correction: SHELXL-2019/3 (Sheldrick, 2015b), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$ |
| 1193 reflections | Extinction coefficient: 0.000262 (16) |
| 66 parameters | |
| 2 restraints | |
| Primary atom site location: dual | |

*Special details*

**Geometry**. All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å$^2$)*

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| Ru1 | 0.000000 | 0.000000 | 0.500000 | 0.00463 (7) | |
| Ru2 | 0.000000 | 0.000000 | 0.28833 (2) | 0.00519 (6) | |
| Ru3 | 0.24368 (2) | 0.24916 (2) | 0.09171 (2) | 0.00467 (5) | |

| | | | | | |
|---|---|---|---|---|---|
| Al4 | 0.000000 | 0.000000 | 0.12554 (5) | 0.01068 (17) | |
| Si5 | 0.06845 (5) | 0.25394 (5) | 0.29541 (2) | 0.00880 (9) | |
| Al6 | 0.22915 (5) | 0.16512 (5) | 0.21432 (2) | 0.0079 (2) | 0.58 (4) |
| Si6 | 0.22915 (5) | 0.16512 (5) | 0.21432 (2) | 0.0079 (2) | 0.42 (4) |
| Al7 | 0.00143 (5) | 0.21088 (5) | 0.03958 (2) | 0.0076 (2) | 0.82 (4) |
| Si7 | 0.00143 (5) | 0.21088 (5) | 0.03958 (2) | 0.0076 (2) | 0.18 (4) |
| Al8 | 0.16504 (5) | 0.12448 (5) | 0.39021 (2) | 0.00948 (10) | |
| Al9 | 0.12627 (6) | 0.37148 (6) | 0.16275 (2) | 0.01084 (11) | |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ru1 | 0.00464 (9) | 0.00464 (9) | 0.00459 (13) | 0.00232 (5) | 0.000 | 0.000 |
| Ru2 | 0.00444 (7) | 0.00444 (7) | 0.00667 (10) | 0.00222 (4) | 0.000 | 0.000 |
| Ru3 | 0.00486 (7) | 0.00394 (7) | 0.00529 (7) | 0.00224 (5) | 0.00054 (4) | 0.00006 (4) |
| Al4 | 0.0066 (2) | 0.0066 (2) | 0.0189 (4) | 0.00329 (12) | 0.000 | 0.000 |
| Si5 | 0.0109 (2) | 0.0054 (2) | 0.0101 (2) | 0.00405 (18) | −0.00401 (16) | −0.00003 (16) |
| Al6 | 0.0076 (3) | 0.0096 (3) | 0.0073 (3) | 0.0048 (2) | 0.00127 (16) | 0.00249 (17) |
| Si6 | 0.0076 (3) | 0.0096 (3) | 0.0073 (3) | 0.0048 (2) | 0.00127 (16) | 0.00249 (17) |
| Al7 | 0.0059 (3) | 0.0102 (3) | 0.0061 (3) | 0.0036 (2) | 0.00001 (16) | −0.00019 (17) |
| Si7 | 0.0059 (3) | 0.0102 (3) | 0.0061 (3) | 0.0036 (2) | 0.00001 (16) | −0.00019 (17) |
| Al8 | 0.0074 (2) | 0.0088 (2) | 0.0076 (2) | 0.00063 (19) | −0.00180 (18) | −0.00055 (17) |
| Al9 | 0.0098 (2) | 0.0097 (2) | 0.0121 (2) | 0.0042 (2) | 0.00506 (18) | −0.00117 (19) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ru1—Al8$^{i}$ | 2.6625 (5) | Ru3—Al7$^{xv}$ | 2.6119 (5) |
| Ru1—Al8$^{ii}$ | 2.6625 (5) | Ru3—Al4 | 2.6597 (3) |
| Ru1—Al8$^{iii}$ | 2.6625 (5) | Ru3—Al7$^{ii}$ | 2.6643 (5) |
| Ru1—Al8$^{iv}$ | 2.6626 (5) | Al4—Al6$^{iv}$ | 2.7622 (7) |
| Ru1—Al8$^{v}$ | 2.6626 (5) | Al4—Al6$^{ii}$ | 2.7622 (7) |
| Ru1—Al8 | 2.6626 (5) | Al4—Al6 | 2.7622 (7) |
| Ru1—Al9$^{vi}$ | 2.7432 (5) | Al4—Al7 | 2.7718 (7) |
| Ru1—Al9$^{vii}$ | 2.7432 (5) | Al4—Al7$^{iv}$ | 2.7718 (7) |
| Ru1—Al9$^{viii}$ | 2.7432 (5) | Al4—Al7$^{ii}$ | 2.7718 (7) |
| Ru1—Al9$^{ix}$ | 2.7432 (5) | Si5—Si5$^{ix}$ | 2.4056 (9) |
| Ru1—Al9$^{x}$ | 2.7433 (5) | Si5—Al8$^{ix}$ | 2.6749 (6) |
| Ru1—Al9$^{xi}$ | 2.7433 (5) | Si5—Al6$^{iv}$ | 2.7560 (6) |
| Ru2—Si5$^{ii}$ | 2.3817 (4) | Si5—Al8 | 2.7736 (6) |
| Ru2—Si5 | 2.3817 (4) | Si5—Al6 | 2.7899 (6) |
| Ru2—Si5$^{iv}$ | 2.3817 (4) | Si5—Al9 | 2.8188 (7) |
| Ru2—Al8 | 2.5380 (5) | Si5—Al8$^{iv}$ | 2.8319 (7) |
| Ru2—Al8$^{ii}$ | 2.5380 (5) | Al6—Al7$^{xii}$ | 2.6531 (6) |
| Ru2—Al8$^{iv}$ | 2.5381 (5) | Al6—Al9$^{xii}$ | 2.8394 (7) |
| Ru2—Al6$^{ii}$ | 2.5880 (5) | Al6—Al6$^{xiv}$ | 2.8614 (9) |
| Ru2—Al6$^{iv}$ | 2.5880 (5) | Al7—Al7$^{xvi}$ | 2.6922 (6) |
| Ru2—Al6 | 2.5881 (5) | Al7—Al7$^{xv}$ | 2.6922 (6) |
| Ru3—Si5$^{xii}$ | 2.4214 (4) | Al7—Al9 | 2.8639 (7) |

| | | | |
|---|---|---|---|
| Ru3—Al8$^{xiii}$ | 2.5175 (5) | Al8—Al9$^{vii}$ | 2.6172 (7) |
| Ru3—Al6 | 2.5459 (5) | Al8—Al8$^{ii}$ | 2.6956 (8) |
| Ru3—Al7 | 2.5702 (5) | Al8—Al8$^{iv}$ | 2.6957 (8) |
| Ru3—Al9$^{xii}$ | 2.5708 (5) | Al8—Al9$^{ix}$ | 2.7562 (7) |
| Ru3—Al9 | 2.5806 (5) | Al9—Al9$^{xii}$ | 2.7465 (5) |
| Ru3—Al6$^{xiv}$ | 2.6110 (5) | Al9—Al9$^{xvii}$ | 2.7465 (5) |

| | | | |
|---|---|---|---|
| Al8$^{i}$—Ru1—Al8$^{ii}$ | 180.0 | Si5$^{ix}$—Si5—Al8$^{ix}$ | 65.93 (2) |
| Al8$^{i}$—Ru1—Al8$^{iii}$ | 60.824 (17) | Ru3$^{xvii}$—Si5—Al8$^{ix}$ | 58.956 (14) |
| Al8$^{ii}$—Ru1—Al8$^{iii}$ | 119.176 (17) | Ru2—Si5—Al6$^{iv}$ | 59.969 (14) |
| Al8$^{i}$—Ru1—Al8$^{iv}$ | 119.176 (17) | Si5$^{ix}$—Si5—Al6$^{iv}$ | 177.02 (3) |
| Al8$^{ii}$—Ru1—Al8$^{iv}$ | 60.824 (17) | Ru3$^{xvii}$—Si5—Al6$^{iv}$ | 60.159 (14) |
| Al8$^{iii}$—Ru1—Al8$^{iv}$ | 119.176 (17) | Al8$^{ix}$—Si5—Al6$^{iv}$ | 115.87 (2) |
| Al8$^{i}$—Ru1—Al8$^{v}$ | 60.824 (17) | Ru2—Si5—Al8 | 58.394 (14) |
| Al8$^{ii}$—Ru1—Al8$^{v}$ | 119.176 (17) | Si5$^{ix}$—Si5—Al8 | 61.71 (2) |
| Al8$^{iii}$—Ru1—Al8$^{v}$ | 60.824 (17) | Ru3$^{xvii}$—Si5—Al8 | 159.94 (2) |
| Al8$^{iv}$—Ru1—Al8$^{v}$ | 180.000 (12) | Al8$^{ix}$—Si5—Al8 | 127.637 (19) |
| Al8$^{i}$—Ru1—Al8 | 119.177 (17) | Al6$^{iv}$—Si5—Al8 | 116.45 (2) |
| Al8$^{ii}$—Ru1—Al8 | 60.823 (17) | Ru2—Si5—Al6 | 59.434 (14) |
| Al8$^{iii}$—Ru1—Al8 | 179.999 (12) | Si5$^{ix}$—Si5—Al6 | 97.84 (3) |
| Al8$^{iv}$—Ru1—Al8 | 60.824 (17) | Ru3$^{xvii}$—Si5—Al6 | 119.201 (19) |
| Al8$^{v}$—Ru1—Al8 | 119.176 (17) | Al8$^{ix}$—Si5—Al6 | 109.51 (2) |
| Al8$^{i}$—Ru1—Al9$^{vi}$ | 89.014 (15) | Al6$^{iv}$—Si5—Al6 | 83.85 (2) |
| Al8$^{ii}$—Ru1—Al9$^{vi}$ | 90.986 (15) | Al8—Si5—Al6 | 78.242 (18) |
| Al8$^{iii}$—Ru1—Al9$^{vi}$ | 57.891 (14) | Ru2—Si5—Al9 | 108.102 (19) |
| Al8$^{iv}$—Ru1—Al9$^{vi}$ | 61.286 (14) | Si5$^{ix}$—Si5—Al9 | 110.55 (3) |
| Al8$^{v}$—Ru1—Al9$^{vi}$ | 118.714 (14) | Ru3$^{xvii}$—Si5—Al9 | 58.171 (14) |
| Al8—Ru1—Al9$^{vi}$ | 122.110 (14) | Al8$^{ix}$—Si5—Al9 | 60.157 (17) |
| Al8$^{i}$—Ru1—Al9$^{vii}$ | 90.986 (15) | Al6$^{iv}$—Si5—Al9 | 72.378 (18) |
| Al8$^{ii}$—Ru1—Al9$^{vii}$ | 89.014 (15) | Al8—Si5—Al9 | 141.66 (2) |
| Al8$^{iii}$—Ru1—Al9$^{vii}$ | 122.109 (14) | Al6—Si5—Al9 | 65.278 (17) |
| Al8$^{iv}$—Ru1—Al9$^{vii}$ | 118.714 (14) | Ru2—Si5—Al8$^{iv}$ | 57.488 (14) |
| Al8$^{v}$—Ru1—Al9$^{vii}$ | 61.286 (14) | Si5$^{ix}$—Si5—Al8$^{iv}$ | 99.22 (3) |
| Al8—Ru1—Al9$^{vii}$ | 57.890 (14) | Ru3$^{xvii}$—Si5—Al8$^{iv}$ | 103.669 (19) |
| Al9$^{vi}$—Ru1—Al9$^{vii}$ | 180.0 | Al8$^{ix}$—Si5—Al8$^{iv}$ | 134.55 (2) |
| Al8$^{i}$—Ru1—Al9$^{viii}$ | 122.109 (14) | Al6$^{iv}$—Si5—Al8$^{iv}$ | 77.825 (18) |
| Al8$^{ii}$—Ru1—Al9$^{viii}$ | 57.891 (14) | Al8—Si5—Al8$^{iv}$ | 57.48 (2) |
| Al8$^{iii}$—Ru1—Al9$^{viii}$ | 61.285 (14) | Al6—Si5—Al8$^{iv}$ | 115.13 (2) |
| Al8$^{iv}$—Ru1—Al9$^{viii}$ | 89.013 (15) | Al9—Si5—Al8$^{iv}$ | 150.02 (2) |
| Al8$^{v}$—Ru1—Al9$^{viii}$ | 90.987 (15) | Ru3—Al6—Ru2 | 129.707 (19) |
| Al8—Ru1—Al9$^{viii}$ | 118.714 (14) | Ru3—Al6—Ru3$^{xiv}$ | 112.612 (17) |
| Al9$^{vi}$—Ru1—Al9$^{viii}$ | 60.077 (1) | Ru2—Al6—Ru3$^{xiv}$ | 106.091 (16) |
| Al9$^{vii}$—Ru1—Al9$^{viii}$ | 119.923 (1) | Ru3—Al6—Al7$^{xii}$ | 116.69 (2) |
| Al8$^{i}$—Ru1—Al9$^{ix}$ | 57.891 (14) | Ru2—Al6—Al7$^{xii}$ | 109.655 (19) |
| Al8$^{ii}$—Ru1—Al9$^{ix}$ | 122.109 (14) | Ru3$^{xiv}$—Al6—Al7$^{xii}$ | 60.806 (14) |
| Al8$^{iii}$—Ru1—Al9$^{ix}$ | 118.715 (14) | Ru3—Al6—Si5$^{ii}$ | 143.99 (2) |
| Al8$^{iv}$—Ru1—Al9$^{ix}$ | 90.987 (15) | Ru2—Al6—Si5$^{ii}$ | 52.818 (13) |
| Al8$^{v}$—Ru1—Al9$^{ix}$ | 89.013 (15) | Ru3$^{xiv}$—Al6—Si5$^{ii}$ | 53.554 (13) |

| | | | |
|---|---|---|---|
| Al8—Ru1—Al9$^{ix}$ | 61.286 (14) | Al7$^{xii}$—Al6—Si5$^{ii}$ | 86.919 (19) |
| Al9$^{vi}$—Ru1—Al9$^{ix}$ | 119.923 (1) | Ru3—Al6—Al4 | 59.976 (17) |
| Al9$^{vii}$—Ru1—Al9$^{ix}$ | 60.077 (1) | Ru2—Al6—Al4 | 73.471 (19) |
| Al9$^{viii}$—Ru1—Al9$^{ix}$ | 180.0 | Ru3$^{xiv}$—Al6—Al4 | 119.885 (18) |
| Al8$^{i}$—Ru1—Al9$^{x}$ | 118.713 (14) | Al7$^{xii}$—Al6—Al4 | 176.66 (3) |
| Al8$^{ii}$—Ru1—Al9$^{x}$ | 61.287 (14) | Si5$^{ii}$—Al6—Al4 | 96.03 (2) |
| Al8$^{iii}$—Ru1—Al9$^{x}$ | 89.012 (15) | Ru3—Al6—Si5 | 111.671 (19) |
| Al8$^{iv}$—Ru1—Al9$^{x}$ | 122.111 (14) | Ru2—Al6—Si5 | 52.410 (13) |
| Al8$^{v}$—Ru1—Al9$^{x}$ | 57.889 (14) | Ru3$^{xiv}$—Al6—Si5 | 133.10 (2) |
| Al8—Ru1—Al9$^{x}$ | 90.987 (15) | Al7$^{xii}$—Al6—Si5 | 85.969 (18) |
| Al9$^{vi}$—Ru1—Al9$^{x}$ | 119.921 (1) | Si5$^{ii}$—Al6—Si5 | 95.90 (2) |
| Al9$^{vii}$—Ru1—Al9$^{x}$ | 60.079 (1) | Al4—Al6—Si5 | 95.257 (19) |
| Al9$^{viii}$—Ru1—Al9$^{x}$ | 60.079 (1) | Ru3—Al6—Al9$^{xii}$ | 56.713 (13) |
| Al9$^{ix}$—Ru1—Al9$^{x}$ | 119.921 (1) | Ru2—Al6—Al9$^{xii}$ | 144.13 (2) |
| Al8$^{i}$—Ru1—Al9$^{xi}$ | 61.287 (14) | Ru3$^{xiv}$—Al6—Al9$^{xii}$ | 99.795 (18) |
| Al8$^{ii}$—Ru1—Al9$^{xi}$ | 118.713 (14) | Al7$^{xii}$—Al6—Al9$^{xii}$ | 62.748 (17) |
| Al8$^{iii}$—Ru1—Al9$^{xi}$ | 90.988 (15) | Si5$^{ii}$—Al6—Al9$^{xii}$ | 148.12 (2) |
| Al8$^{iv}$—Ru1—Al9$^{xi}$ | 57.889 (14) | Al4—Al6—Al9$^{xii}$ | 114.07 (2) |
| Al8$^{v}$—Ru1—Al9$^{xi}$ | 122.111 (14) | Si5—Al6—Al9$^{xii}$ | 91.741 (19) |
| Al8—Ru1—Al9$^{xi}$ | 89.013 (15) | Ru3—Al6—Al6$^{xiv}$ | 57.391 (15) |
| Al9$^{vi}$—Ru1—Al9$^{xi}$ | 60.079 (1) | Ru2—Al6—Al6$^{xiv}$ | 145.22 (3) |
| Al9$^{vii}$—Ru1—Al9$^{xi}$ | 119.921 (1) | Ru3$^{xiv}$—Al6—Al6$^{xiv}$ | 55.221 (15) |
| Al9$^{viii}$—Ru1—Al9$^{xi}$ | 119.921 (1) | Al7$^{xii}$—Al6—Al6$^{xiv}$ | 87.39 (2) |
| Al9$^{ix}$—Ru1—Al9$^{xi}$ | 60.079 (1) | Si5$^{ii}$—Al6—Al6$^{xiv}$ | 100.23 (2) |
| Al9$^{x}$—Ru1—Al9$^{xi}$ | 180.0 | Al4—Al6—Al6$^{xiv}$ | 90.54 (2) |
| Si5$^{ii}$—Ru2—Si5 | 119.661 (2) | Si5—Al6—Al6$^{xiv}$ | 162.19 (3) |
| Si5$^{ii}$—Ru2—Si5$^{iv}$ | 119.662 (2) | Al9$^{xii}$—Al6—Al6$^{xiv}$ | 70.54 (2) |
| Si5—Ru2—Si5$^{iv}$ | 119.659 (2) | Ru3—Al7—Ru3$^{xvi}$ | 117.649 (18) |
| Si5$^{ii}$—Ru2—Al8 | 70.202 (16) | Ru3—Al7—Al6$^{xvii}$ | 116.63 (2) |
| Si5—Ru2—Al8 | 68.549 (15) | Ru3$^{xvi}$—Al7—Al6$^{xvii}$ | 119.15 (2) |
| Si5$^{iv}$—Ru2—Al8 | 124.453 (17) | Ru3—Al7—Ru3$^{iv}$ | 116.862 (18) |
| Si5$^{ii}$—Ru2—Al8$^{ii}$ | 68.549 (15) | Ru3$^{xvi}$—Al7—Ru3$^{iv}$ | 114.346 (17) |
| Si5—Ru2—Al8$^{ii}$ | 124.452 (17) | Al6$^{xvii}$—Al7—Ru3$^{iv}$ | 58.818 (14) |
| Si5$^{iv}$—Ru2—Al8$^{ii}$ | 70.202 (16) | Ru3—Al7—Al7$^{xvi}$ | 134.381 (13) |
| Al8—Ru2—Al8$^{ii}$ | 64.153 (18) | Ru3$^{xvi}$—Al7—Al7$^{xvi}$ | 57.944 (19) |
| Si5$^{ii}$—Ru2—Al8$^{iv}$ | 124.453 (17) | Al6$^{xvii}$—Al7—Al7$^{xvi}$ | 99.12 (2) |
| Si5—Ru2—Al8$^{iv}$ | 70.202 (16) | Ru3$^{iv}$—Al7—Al7$^{xvi}$ | 58.365 (12) |
| Si5$^{iv}$—Ru2—Al8$^{iv}$ | 68.548 (15) | Ru3—Al7—Al7$^{xv}$ | 59.461 (12) |
| Al8—Ru2—Al8$^{iv}$ | 64.153 (18) | Ru3$^{xvi}$—Al7—Al7$^{xv}$ | 60.283 (19) |
| Al8$^{ii}$—Ru2—Al8$^{iv}$ | 64.152 (18) | Al6$^{xvii}$—Al7—Al7$^{xv}$ | 168.67 (2) |
| Si5$^{ii}$—Ru2—Al6$^{ii}$ | 68.158 (15) | Ru3$^{iv}$—Al7—Al7$^{xv}$ | 132.432 (13) |
| Si5—Ru2—Al6$^{ii}$ | 149.111 (17) | Al7$^{xvi}$—Al7—Al7$^{xv}$ | 89.88 (2) |
| Si5$^{iv}$—Ru2—Al6$^{ii}$ | 67.213 (15) | Ru3—Al7—Al4 | 59.578 (10) |
| Al8—Ru2—Al6$^{ii}$ | 135.530 (15) | Ru3$^{xvi}$—Al7—Al4 | 135.92 (2) |
| Al8$^{ii}$—Ru2—Al6$^{ii}$ | 86.437 (15) | Al6$^{xvii}$—Al7—Al4 | 94.86 (2) |
| Al8$^{iv}$—Ru2—Al6$^{ii}$ | 132.991 (15) | Ru3$^{iv}$—Al7—Al4 | 58.545 (10) |
| Si5$^{ii}$—Ru2—Al6$^{iv}$ | 149.112 (17) | Al7$^{xvi}$—Al7—Al4 | 91.721 (15) |
| Si5—Ru2—Al6$^{iv}$ | 67.211 (15) | Al7$^{xv}$—Al7—Al4 | 91.721 (15) |

| | | | |
|---|---|---|---|
| Si5$^{iv}$—Ru2—Al6$^{iv}$ | 68.157 (15) | Ru3—Al7—Al9 | 56.394 (14) |
| Al8—Ru2—Al6$^{iv}$ | 132.990 (15) | Ru3$^{xvi}$—Al7—Al9 | 142.61 (2) |
| Al8$^{ii}$—Ru2—Al6$^{iv}$ | 135.529 (15) | Al6$^{xvii}$—Al7—Al9 | 61.810 (17) |
| Al8$^{iv}$—Ru2—Al6$^{iv}$ | 86.436 (15) | Ru3$^{iv}$—Al7—Al9 | 97.917 (17) |
| Al6$^{ii}$—Ru2—Al6$^{iv}$ | 91.441 (15) | Al7$^{xvi}$—Al7—Al9 | 156.03 (3) |
| Si5$^{ii}$—Ru2—Al6 | 67.213 (15) | Al7$^{xv}$—Al7—Al9 | 111.07 (2) |
| Si5—Ru2—Al6 | 68.157 (15) | Al4—Al7—Al9 | 76.65 (2) |
| Si5$^{iv}$—Ru2—Al6 | 149.112 (17) | Ru3$^{vii}$—Al8—Ru2 | 143.54 (2) |
| Al8—Ru2—Al6 | 86.435 (15) | Ru3$^{vii}$—Al8—Al9$^{vii}$ | 60.306 (15) |
| Al8$^{ii}$—Ru2—Al6 | 132.991 (15) | Ru2—Al8—Al9$^{vii}$ | 145.45 (2) |
| Al8$^{iv}$—Ru2—Al6 | 135.529 (15) | Ru3$^{vii}$—Al8—Ru1 | 109.918 (17) |
| Al6$^{ii}$—Ru2—Al6 | 91.442 (15) | Ru2—Al8—Ru1 | 106.409 (17) |
| Al6$^{iv}$—Ru2—Al6 | 91.441 (15) | Al9$^{vii}$—Al8—Ru1 | 62.599 (15) |
| Si5$^{xii}$—Ru3—Al8$^{xiii}$ | 65.551 (15) | Ru3$^{vii}$—Al8—Si5$^{ix}$ | 55.492 (14) |
| Si5$^{xii}$—Ru3—Al6 | 120.406 (15) | Ru2—Al8—Si5$^{ix}$ | 104.439 (19) |
| Al8$^{xiii}$—Ru3—Al6 | 124.414 (16) | Al9$^{vii}$—Al8—Si5$^{ix}$ | 109.63 (2) |
| Si5$^{xii}$—Ru3—Al7 | 122.217 (15) | Ru1—Al8—Si5$^{ix}$ | 117.12 (2) |
| Al8$^{xiii}$—Ru3—Al7 | 73.932 (16) | Ru3$^{vii}$—Al8—Al8$^{ii}$ | 149.08 (3) |
| Al6—Ru3—Al7 | 116.122 (15) | Ru2—Al8—Al8$^{ii}$ | 57.924 (9) |
| Si5$^{xii}$—Ru3—Al9$^{xii}$ | 68.678 (16) | Al9$^{vii}$—Al8—Al8$^{ii}$ | 91.00 (2) |
| Al8$^{xiii}$—Ru3—Al9$^{xii}$ | 65.586 (16) | Ru1—Al8—Al8$^{ii}$ | 59.587 (8) |
| Al6—Ru3—Al9$^{xii}$ | 67.410 (16) | Si5$^{ix}$—Al8—Al8$^{ii}$ | 155.06 (3) |
| Al7—Ru3—Al9$^{xii}$ | 127.455 (16) | Ru3$^{vii}$—Al8—Al8$^{iv}$ | 143.73 (3) |
| Si5$^{xii}$—Ru3—Al9 | 119.665 (16) | Ru2—Al8—Al8$^{iv}$ | 57.925 (9) |
| Al8$^{xiii}$—Ru3—Al9 | 61.760 (16) | Al9$^{vii}$—Al8—Al8$^{iv}$ | 122.187 (15) |
| Al6—Ru3—Al9 | 72.324 (16) | Ru1—Al8—Al8$^{iv}$ | 59.588 (8) |
| Al7—Ru3—Al9 | 67.560 (16) | Si5$^{ix}$—Al8—Al8$^{iv}$ | 96.24 (3) |
| Al9$^{xii}$—Ru3—Al9 | 64.436 (17) | Al8$^{ii}$—Al8—Al8$^{iv}$ | 60.0 |
| Si5$^{xii}$—Ru3—Al6$^{xiv}$ | 66.289 (14) | Ru3$^{vii}$—Al8—Al9$^{ix}$ | 58.136 (15) |
| Al8$^{xiii}$—Ru3—Al6$^{xiv}$ | 127.640 (16) | Ru2—Al8—Al9$^{ix}$ | 145.13 (2) |
| Al6—Ru3—Al6$^{xiv}$ | 67.389 (17) | Al9$^{vii}$—Al8—Al9$^{ix}$ | 61.411 (12) |
| Al7—Ru3—Al6$^{xiv}$ | 153.459 (16) | Ru1—Al8—Al9$^{ix}$ | 60.799 (14) |
| Al9$^{xii}$—Ru3—Al6$^{xiv}$ | 78.881 (16) | Si5$^{ix}$—Al8—Al9$^{ix}$ | 62.510 (18) |
| Al9—Ru3—Al6$^{xiv}$ | 133.370 (16) | Al8$^{ii}$—Al8—Al9$^{ix}$ | 120.386 (14) |
| Si5$^{xii}$—Ru3—Al7$^{xv}$ | 71.465 (15) | Al8$^{iv}$—Al8—Al9$^{ix}$ | 90.01 (2) |
| Al8$^{xiii}$—Ru3—Al7$^{xv}$ | 80.729 (15) | Ru3$^{vii}$—Al8—Si5 | 104.754 (19) |
| Al6—Ru3—Al7$^{xv}$ | 154.440 (16) | Ru2—Al8—Si5 | 53.057 (13) |
| Al7—Ru3—Al7$^{xv}$ | 62.594 (14) | Al9$^{vii}$—Al8—Si5 | 161.49 (2) |
| Al9$^{xii}$—Ru3—Al7$^{xv}$ | 135.585 (16) | Ru1—Al8—Si5 | 118.64 (2) |
| Al9—Ru3—Al7$^{xv}$ | 123.870 (16) | Si5$^{ix}$—Al8—Si5 | 52.363 (19) |
| Al6$^{xiv}$—Ru3—Al7$^{xv}$ | 102.325 (15) | Al8$^{ii}$—Al8—Si5 | 105.493 (16) |
| Si5$^{xii}$—Ru3—Al4 | 156.665 (16) | Al8$^{iv}$—Al8—Si5 | 62.348 (19) |
| Al8$^{xiii}$—Ru3—Al4 | 133.431 (13) | Al9$^{ix}$—Al8—Si5 | 102.09 (2) |
| Al6—Ru3—Al4 | 64.05 (2) | Ru3$^{vii}$—Al8—Si5$^{ii}$ | 111.11 (2) |
| Al7—Ru3—Al4 | 63.982 (15) | Ru2—Al8—Si5$^{ii}$ | 52.311 (13) |
| Al9$^{xii}$—Ru3—Al4 | 127.93 (2) | Al9$^{vii}$—Al8—Si5$^{ii}$ | 101.04 (2) |
| Al9—Ru3—Al4 | 83.669 (15) | Ru1—Al8—Si5$^{ii}$ | 116.598 (19) |
| Al6$^{xiv}$—Ru3—Al4 | 98.593 (12) | Si5$^{ix}$—Al8—Si5$^{ii}$ | 125.72 (2) |

| | | | |
|---|---|---|---|
| Al7$^{xv}$—Ru3—Al4 | 96.13 (2) | Al8$^{ii}$—Al8—Si5$^{ii}$ | 60.177 (19) |
| Si5$^{xii}$—Ru3—Al7$^{ii}$ | 93.941 (15) | Al8$^{iv}$—Al8—Si5$^{ii}$ | 103.902 (16) |
| Al8$^{xiii}$—Ru3—Al7$^{ii}$ | 141.416 (15) | Al9$^{ix}$—Al8—Si5$^{ii}$ | 162.00 (2) |
| Al6—Ru3—Al7$^{ii}$ | 94.038 (15) | Si5—Al8—Si5$^{ii}$ | 94.55 (2) |
| Al7—Ru3—Al7$^{ii}$ | 93.18 (2) | Ru3$^{xvii}$—Al9—Ru3 | 147.99 (2) |
| Al9$^{xii}$—Ru3—Al7$^{ii}$ | 139.245 (16) | Ru3$^{xvii}$—Al9—Al8$^{xiii}$ | 148.40 (2) |
| Al9—Ru3—Al7$^{ii}$ | 146.275 (16) | Ru3—Al9—Al8$^{xiii}$ | 57.934 (15) |
| Al6$^{xiv}$—Ru3—Al7$^{ii}$ | 60.377 (15) | Ru3$^{xvii}$—Al9—Ru1$^{xviii}$ | 105.884 (17) |
| Al7$^{xv}$—Ru3—Al7$^{ii}$ | 61.353 (14) | Ru3—Al9—Ru1$^{xviii}$ | 105.607 (17) |
| Al4—Ru3—Al7$^{ii}$ | 62.748 (15) | Al8$^{xiii}$—Al9—Ru1$^{xviii}$ | 59.509 (15) |
| Ru3—Al4—Ru3$^{iv}$ | 113.957 (15) | Ru3$^{xvii}$—Al9—Al9$^{xii}$ | 138.86 (3) |
| Ru3—Al4—Ru3$^{ii}$ | 113.956 (15) | Ru3—Al9—Al9$^{xii}$ | 57.609 (18) |
| Ru3$^{iv}$—Al4—Ru3$^{ii}$ | 113.956 (15) | Al8$^{xiii}$—Al9—Al9$^{xii}$ | 61.789 (18) |
| Ru3—Al4—Al6$^{iv}$ | 109.230 (14) | Ru1$^{xviii}$—Al9—Al9$^{xii}$ | 59.959 (1) |
| Ru3$^{iv}$—Al4—Al6$^{iv}$ | 55.974 (11) | Ru3$^{xvii}$—Al9—Al9$^{xvii}$ | 57.955 (19) |
| Ru3$^{ii}$—Al4—Al6$^{iv}$ | 134.84 (2) | Ru3—Al9—Al9$^{xvii}$ | 148.22 (3) |
| Ru3—Al4—Al6$^{ii}$ | 134.84 (2) | Al8$^{xiii}$—Al9—Al9$^{xvii}$ | 91.89 (2) |
| Ru3$^{iv}$—Al4—Al6$^{ii}$ | 109.230 (14) | Ru1$^{xviii}$—Al9—Al9$^{xvii}$ | 60.0 |
| Ru3$^{ii}$—Al4—Al6$^{ii}$ | 55.974 (11) | Al9$^{xii}$—Al9—Al9$^{xvii}$ | 119.687 (4) |
| Al6$^{iv}$—Al4—Al6$^{ii}$ | 84.26 (3) | Ru3$^{xvii}$—Al9—Al8$^{ix}$ | 56.276 (14) |
| Ru3—Al4—Al6 | 55.973 (11) | Ru3—Al9—Al8$^{ix}$ | 143.01 (2) |
| Ru3$^{iv}$—Al4—Al6 | 134.84 (2) | Al8$^{xiii}$—Al9—Al8$^{ix}$ | 117.42 (3) |
| Ru3$^{ii}$—Al4—Al6 | 109.231 (14) | Ru1$^{xviii}$—Al9—Al8$^{ix}$ | 57.913 (14) |
| Al6$^{iv}$—Al4—Al6 | 84.26 (3) | Al9$^{xii}$—Al9—Al8$^{ix}$ | 87.05 (2) |
| Al6$^{ii}$—Al4—Al6 | 84.26 (3) | Al9$^{xvii}$—Al9—Al8$^{ix}$ | 56.799 (18) |
| Ru3—Al4—Al7 | 56.440 (13) | Ru3$^{xvii}$—Al9—Si5 | 53.152 (13) |
| Ru3$^{iv}$—Al4—Al7 | 58.708 (14) | Ru3—Al9—Si5 | 109.71 (2) |
| Ru3$^{ii}$—Al4—Al7 | 127.88 (3) | Al8$^{xiii}$—Al9—Si5 | 154.89 (3) |
| Al6$^{iv}$—Al4—Al7 | 87.091 (13) | Ru1$^{xviii}$—Al9—Si5 | 109.909 (19) |
| Al6$^{ii}$—Al4—Al7 | 167.862 (14) | Al9$^{xii}$—Al9—Si5 | 93.10 (3) |
| Al6—Al4—Al7 | 103.356 (14) | Al9$^{xvii}$—Al9—Si5 | 102.00 (3) |
| Ru3—Al4—Al7$^{iv}$ | 127.88 (3) | Al8$^{ix}$—Al9—Si5 | 57.332 (16) |
| Ru3$^{iv}$—Al4—Al7$^{iv}$ | 56.439 (13) | Ru3$^{xvii}$—Al9—Al6$^{xvii}$ | 55.877 (14) |
| Ru3$^{ii}$—Al4—Al7$^{iv}$ | 58.708 (14) | Ru3—Al9—Al6$^{xvii}$ | 110.10 (2) |
| Al6$^{iv}$—Al4—Al7$^{iv}$ | 103.357 (14) | Al8$^{xiii}$—Al9—Al6$^{xvii}$ | 105.54 (2) |
| Al6$^{ii}$—Al4—Al7$^{iv}$ | 87.091 (13) | Ru1$^{xviii}$—Al9—Al6$^{xvii}$ | 121.90 (2) |
| Al6—Al4—Al7$^{iv}$ | 167.862 (14) | Al9$^{xii}$—Al9—Al6$^{xvii}$ | 165.26 (3) |
| Al7—Al4—Al7$^{iv}$ | 86.64 (2) | Al9$^{xvii}$—Al9—Al6$^{xvii}$ | 65.56 (2) |
| Ru3—Al4—Al7$^{ii}$ | 58.708 (14) | Al8$^{ix}$—Al9—Al6$^{xvii}$ | 106.35 (2) |
| Ru3$^{iv}$—Al4—Al7$^{ii}$ | 127.88 (3) | Si5—Al9—Al6$^{xvii}$ | 99.26 (2) |
| Ru3$^{ii}$—Al4—Al7$^{ii}$ | 56.439 (13) | Ru3$^{xvii}$—Al9—Al7 | 108.93 (2) |
| Al6$^{iv}$—Al4—Al7$^{ii}$ | 167.862 (14) | Ru3—Al9—Al7 | 56.047 (14) |
| Al6$^{ii}$—Al4—Al7$^{ii}$ | 103.357 (14) | Al8$^{xiii}$—Al9—Al7 | 67.695 (18) |
| Al6—Al4—Al7$^{ii}$ | 87.091 (13) | Ru1$^{xviii}$—Al9—Al7 | 123.68 (2) |
| Al7—Al4—Al7$^{ii}$ | 86.64 (2) | Al9$^{xii}$—Al9—Al7 | 110.49 (3) |
| Al7$^{iv}$—Al4—Al7$^{ii}$ | 86.64 (2) | Al9$^{xvii}$—Al9—Al7 | 105.97 (3) |
| Ru2—Si5—Si5$^{ix}$ | 118.81 (3) | Al8$^{ix}$—Al9—Al7 | 160.85 (2) |
| Ru2—Si5—Ru3$^{xvii}$ | 119.762 (18) | Si5—Al9—Al7 | 126.36 (2) |

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|---|---|---|---|
| Si5$^{ix}$—Si5—Ru3$^{xvii}$ | 120.64 (3) | Al6$^{xvii}$—Al9—Al7 | 55.443 (16) |
| Ru2—Si5—Al8$^{ix}$ | 167.65 (2) | | |

Symmetry codes: (i) *x*−*y*, *x*, −*z*+1; (ii) −*x*+*y*, −*x*, *z*; (iii) −*x*, −*y*, −*z*+1; (iv) −*y*, *x*−*y*, *z*; (v) *y*, −*x*+*y*, −*z*+1; (vi) *y*−2/3, −*x*+*y*−1/3, −*z*+2/3; (vii) −*y*+2/3, *x*−*y*+1/3, *z*+1/3; (viii) *x*−1/3, *y*−2/3, *z*+1/3; (ix) −*x*+1/3, −*y*+2/3, −*z*+2/3; (x) *x*−*y*+1/3, *x*−1/3, −*z*+2/3; (xi) −*x*+*y*−1/3, −*x*+1/3, *z*+1/3; (xii) *x*−*y*+2/3, *x*+1/3, −*z*+1/3; (xiii) −*x*+*y*+1/3, −*x*+2/3, *z*−1/3; (xiv) −*x*+2/3, −*y*+1/3, −*z*+1/3; (xv) *y*, −*x*+*y*, −*z*; (xvi) *x*−*y*, *x*, −*z*; (xvii) *y*−1/3, −*x*+*y*+1/3, −*z*+1/3; (xviii) *x*+1/3, *y*+2/3, *z*−1/3.

## Heptacosaaluminium decaruthenium tridecasilicon (III)

*Crystal data*

~$Ru_{10}(Al_{0.67}Si_{0.33})_{41}$
$M_r$ = 2122.53
Orthorhombic, *Pnma*
*a* = 15.0794 (2) Å
*b* = 11.8713 (2) Å
*c* = 16.9291 (3) Å
*V* = 3030.50 (9) Å$^3$
*Z* = 4
*F*(000) = 3888.20
$D_x$ = 4.652 Mg m$^{-3}$
Mo *Kα* radiation, *λ* = 0.71073 Å
Cell parameters from 16783 reflections
*θ* = 3.4–33.8°
*μ* = 6.18 mm$^{-1}$
*T* = 298 K
Irregular, metallic light silver
0.04 × 0.02 × 0.02 mm

*Data collection*

XtaLAB Synergy R, HyPix diffractometer
Radiation source: micro-focus sealed X-ray tube, Mova (Mo) X-ray Source
Mirror monochromator
Detector resolution: 10.0000 pixels mm$^{-1}$
*ω* scans
Absorption correction: gaussian (CrysAlisPro; Matsumoto *et al.*, 2021)
$T_{min}$ = 0.867, $T_{max}$ = 0.929
33654 measured reflections
5672 independent reflections
4940 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.022
$\theta_{max}$ = 33.7°, $\theta_{min}$ = 3.2°
*h* = −23→21
*k* = −17→18
*l* = −25→24

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.015
$wR(F^2)$ = 0.026
*S* = 1.01
5672 reflections
303 parameters
2 restraints
Primary atom site location: dual
Secondary atom site location: difference Fourier map
$w = 1/[\sigma^2(F_o^2) + (0.0093P)^2 + 1.1293P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.003
$\Delta\rho_{max}$ = 0.78 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.74 e Å$^{-3}$
Extinction correction: SHELXL-2019/3 (Sheldrick, 2015b), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$
Extinction coefficient: 0.000039 (4)

*Special details*

**Geometry**. All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å$^2$)*

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| Ru1 | 0.15195 (2) | 0.250000 | 0.76146 (2) | 0.00513 (3) | |

| | | | | | |
|---|---|---|---|---|---|
| Ru2 | 0.41069 (2) | 0.250000 | 0.87752 (2) | 0.00474 (3) | |
| Ru3 | 0.45013 (2) | 0.250000 | 0.16946 (2) | 0.00542 (3) | |
| Ru4A | 0.1834 (2) | 0.250000 | 0.02174 (3) | 0.00665 (15) | 0.933 (16) |
| Ru4B | 0.1655 (15) | 0.250000 | 0.0209 (4) | 0.0036 (13)* | 0.067 (16) |
| Ru5A | 0.42722 (8) | 0.0630 (2) | 0.38435 (7) | 0.00501 (13) | 0.74 (2) |
| Ru5B | 0.4253 (3) | 0.0509 (5) | 0.3844 (2) | 0.0052 (4)* | 0.26 (2) |
| Ru6 | 0.17223 (2) | 0.06068 (2) | 0.25159 (2) | 0.00500 (3) | |
| Ru7 | 0.15518 (2) | 0.05637 (2) | 0.52078 (2) | 0.00672 (3) | |
| Si8 | 0.20752 (4) | 0.250000 | 0.31440 (3) | 0.00625 (11) | |
| Si9A | 0.37913 (7) | 0.250000 | 0.62569 (5) | 0.0103 (3) | 0.727 (3) |
| Si9B | 0.43672 (17) | 0.250000 | 0.59893 (13) | 0.0095 (7) | 0.273 (3) |
| Si10A | 0.3512 (4) | 0.250000 | 0.38677 (9) | 0.0081 (6) | 0.85 (2) |
| Al10B | 0.3758 (16) | 0.250000 | 0.3830 (5) | 0.0082 (18)* | 0.15 (2) |
| Al11 | 0.19544 (4) | 0.250000 | 0.47722 (4) | 0.0089 (3) | 0.65 (6) |
| Si11 | 0.19544 (4) | 0.250000 | 0.47722 (4) | 0.0089 (3) | 0.35 (6) |
| Al12 | 0.48579 (4) | 0.250000 | 0.74245 (4) | 0.00666 (12) | |
| Al13 | 0.16461 (4) | 0.250000 | 0.16972 (4) | 0.00748 (12) | |
| Al14 | 0.08651 (5) | 0.250000 | 0.60711 (4) | 0.01395 (15) | |
| Al15 | 0.33501 (5) | 0.250000 | 0.07842 (5) | 0.0183 (3) | 0.950 (4) |
| Si16 | 0.05763 (3) | 0.56298 (4) | 0.31273 (2) | 0.00608 (8) | |
| Si17 | 0.41912 (3) | 0.56490 (4) | 0.26431 (2) | 0.00638 (8) | |
| Si18 | 0.19988 (3) | 0.62931 (4) | 0.45426 (2) | 0.00859 (8) | |
| Si19 | 0.02383 (3) | 0.14871 (4) | 0.21915 (2) | 0.00739 (8) | |
| Al20 | 0.21386 (3) | 0.63959 (4) | 0.30297 (3) | 0.0109 (2) | 0.55 (5) |
| Si20 | 0.21386 (3) | 0.63959 (4) | 0.30297 (3) | 0.0109 (2) | 0.45 (5) |
| Al21 | 0.42109 (3) | 0.04580 (4) | 0.12868 (3) | 0.0072 (2) | 0.64 (5) |
| Si21 | 0.42109 (3) | 0.04580 (4) | 0.12868 (3) | 0.0072 (2) | 0.36 (5) |
| Al22 | 0.33859 (3) | 0.11923 (4) | 0.51409 (3) | 0.0115 (2) | 0.67 (5) |
| Si22 | 0.33859 (3) | 0.11923 (4) | 0.51409 (3) | 0.0115 (2) | 0.33 (5) |
| Al23 | 0.33880 (3) | 0.12822 (4) | 0.25123 (3) | 0.00721 (9) | |
| Al24 | 0.25334 (3) | 0.04455 (4) | 0.38472 (3) | 0.00724 (9) | |
| Al25 | 0.07288 (3) | 0.54572 (4) | 0.15156 (3) | 0.00777 (9) | |
| Al26 | 0.08203 (3) | 0.13043 (4) | 0.38371 (3) | 0.00734 (9) | |
| Al27 | 0.21669 (3) | 0.06506 (4) | 0.09349 (3) | 0.01224 (10) | |
| Al28 | 0.02308 (3) | 0.59649 (5) | 0.46632 (3) | 0.01334 (10) | |
| Al29A | 0.3572 (3) | 0.64190 (10) | 0.3938 (2) | 0.0077 (5) | 0.79 (2) |
| Al29B | 0.3742 (7) | 0.6377 (5) | 0.4074 (7) | 0.0109 (11)* | 0.21 (2) |
| Al30A | 0.28629 (14) | 0.6034 (3) | 0.16459 (9) | 0.0188 (6) | 0.754 (11) |
| Al30B | 0.2701 (3) | 0.6380 (5) | 0.1547 (2) | 0.0136 (8)* | 0.246 (11) |
| Al31A | 0.01771 (7) | 0.250000 | 0.07942 (7) | 0.0153 (5) | 0.728 (5) |
| Al31B | 0.0308 (4) | 0.1965 (6) | 0.0529 (4) | 0.015 (2)* | 0.104 (3) |
| Al31C | 0.0457 (8) | 0.1351 (13) | 0.0372 (7) | 0.016 (4)* | 0.047 (3) |
| Al32A | 0.06370 (5) | 0.06801 (7) | 0.01653 (4) | 0.0151 (3) | 0.716 (3) |
| Al32B | 0.0186 (3) | 0.0224 (4) | 0.0048 (3) | 0.0129 (15)* | 0.121 (3) |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ru1 | 0.00431 (7) | 0.00457 (8) | 0.00651 (7) | 0.000 | −0.00060 (6) | 0.000 |
| Ru2 | 0.00433 (7) | 0.00403 (7) | 0.00587 (7) | 0.000 | −0.00033 (5) | 0.000 |
| Ru3 | 0.00414 (7) | 0.00694 (8) | 0.00517 (7) | 0.000 | −0.00026 (6) | 0.000 |
| Ru4A | 0.0081 (5) | 0.00790 (13) | 0.00392 (11) | 0.000 | 0.00035 (13) | 0.000 |
| Ru5A | 0.00401 (16) | 0.0042 (3) | 0.00676 (16) | −0.00089 (18) | 0.00098 (7) | −0.00108 (17) |
| Ru6 | 0.00449 (5) | 0.00601 (6) | 0.00452 (5) | −0.00090 (4) | −0.00053 (4) | 0.00048 (4) |
| Ru7 | 0.00645 (5) | 0.00859 (6) | 0.00513 (5) | 0.00172 (4) | −0.00042 (4) | −0.00090 (4) |
| Si8 | 0.0067 (3) | 0.0055 (3) | 0.0065 (3) | 0.000 | −0.0001 (2) | 0.000 |
| Si9A | 0.0154 (5) | 0.0066 (4) | 0.0088 (4) | 0.000 | −0.0050 (3) | 0.000 |
| Si9B | 0.0144 (15) | 0.0052 (11) | 0.0091 (11) | 0.000 | −0.0036 (9) | 0.000 |
| Si10A | 0.0098 (14) | 0.0055 (4) | 0.0090 (4) | 0.000 | −0.0013 (4) | 0.000 |
| Al11 | 0.0091 (4) | 0.0069 (4) | 0.0108 (4) | 0.000 | −0.0005 (2) | 0.000 |
| Si11 | 0.0091 (4) | 0.0069 (4) | 0.0108 (4) | 0.000 | −0.0005 (2) | 0.000 |
| Al12 | 0.0060 (3) | 0.0063 (3) | 0.0076 (3) | 0.000 | 0.0008 (2) | 0.000 |
| Al13 | 0.0108 (3) | 0.0065 (3) | 0.0051 (3) | 0.000 | 0.0012 (2) | 0.000 |
| Al14 | 0.0090 (3) | 0.0204 (4) | 0.0124 (3) | 0.000 | 0.0002 (3) | 0.000 |
| Al15 | 0.0172 (5) | 0.0158 (5) | 0.0219 (5) | 0.000 | −0.0147 (3) | 0.000 |
| Si16 | 0.00579 (18) | 0.00568 (19) | 0.00676 (18) | 0.00030 (15) | −0.00049 (14) | −0.00084 (14) |
| Si17 | 0.00719 (18) | 0.00518 (19) | 0.00678 (18) | 0.00049 (15) | 0.00114 (14) | 0.00033 (14) |
| Si18 | 0.0088 (2) | 0.0083 (2) | 0.00861 (19) | 0.00025 (16) | −0.00109 (15) | 0.00063 (15) |
| Si19 | 0.00649 (18) | 0.0067 (2) | 0.00891 (19) | 0.00029 (16) | 0.00037 (14) | −0.00100 (15) |
| Al20 | 0.0094 (3) | 0.0074 (3) | 0.0159 (3) | −0.00202 (17) | 0.00544 (17) | −0.00150 (17) |
| Si20 | 0.0094 (3) | 0.0074 (3) | 0.0159 (3) | −0.00202 (17) | 0.00544 (17) | −0.00150 (17) |
| Al21 | 0.0072 (3) | 0.0072 (3) | 0.0072 (3) | −0.00030 (17) | 0.00040 (15) | −0.00223 (16) |
| Si21 | 0.0072 (3) | 0.0072 (3) | 0.0072 (3) | −0.00030 (17) | 0.00040 (15) | −0.00223 (16) |
| Al22 | 0.0143 (3) | 0.0126 (3) | 0.0075 (3) | −0.00185 (19) | −0.00166 (17) | 0.00134 (17) |
| Si22 | 0.0143 (3) | 0.0126 (3) | 0.0075 (3) | −0.00185 (19) | −0.00166 (17) | 0.00134 (17) |
| Al23 | 0.0067 (2) | 0.0077 (2) | 0.0072 (2) | 0.00081 (17) | 0.00118 (16) | 0.00033 (16) |
| Al24 | 0.0070 (2) | 0.0080 (2) | 0.0068 (2) | −0.00033 (17) | −0.00041 (16) | 0.00027 (16) |
| Al25 | 0.0073 (2) | 0.0074 (2) | 0.0086 (2) | −0.00030 (17) | 0.00002 (16) | 0.00109 (17) |
| Al26 | 0.0060 (2) | 0.0076 (2) | 0.0085 (2) | −0.00025 (17) | −0.00033 (16) | 0.00000 (16) |
| Al27 | 0.0154 (2) | 0.0077 (2) | 0.0135 (2) | −0.0003 (2) | 0.00641 (19) | −0.00069 (18) |
| Al28 | 0.0115 (2) | 0.0150 (3) | 0.0135 (2) | −0.0029 (2) | 0.00047 (18) | 0.00552 (19) |
| Al29A | 0.0139 (8) | 0.0046 (4) | 0.0047 (6) | 0.0026 (3) | 0.0010 (6) | −0.0011 (3) |
| Al30A | 0.0182 (6) | 0.0278 (11) | 0.0103 (4) | −0.0093 (7) | 0.0000 (4) | −0.0088 (5) |
| Al31A | 0.0090 (5) | 0.0215 (9) | 0.0155 (6) | 0.000 | −0.0021 (4) | 0.000 |
| Al32A | 0.0167 (5) | 0.0181 (5) | 0.0105 (4) | 0.0000 (3) | 0.0052 (3) | 0.0019 (3) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ru1—Si17$^{i}$ | 2.4453 (4) | Si9B—Al25$^{ii}$ | 2.5876 (10) |
| Ru1—Si17$^{ii}$ | 2.4453 (4) | Si9B—Al25$^{i}$ | 2.5876 (10) |
| Ru1—Al12$^{iii}$ | 2.5063 (7) | Si10A—Al31A$^{vi}$ | 2.576 (5) |
| Ru1—Al20$^{ii}$ | 2.5113 (5) | Si10A—Al22$^{vii}$ | 2.6631 (16) |
| Ru1—Al20$^{i}$ | 2.5113 (5) | Si10A—Al22 | 2.6631 (16) |

| | | | |
|---|---|---|---|
| Ru1—Al30B$^{i}$ | 2.534 (3) | Si10A—Al23$^{vii}$ | 2.7183 (11) |
| Ru1—Al30B$^{ii}$ | 2.534 (3) | Si10A—Al23 | 2.7183 (11) |
| Ru1—Al30A$^{i}$ | 2.5661 (12) | Si10A—Al11 | 2.803 (5) |
| Ru1—Al30A$^{ii}$ | 2.5661 (12) | Al10B—Al31A$^{vi}$ | 2.23 (2) |
| Ru1—Al29A$^{ii}$ | 2.585 (4) | Al10B—Al31B$^{v}$ | 2.65 (2) |
| Ru1—Al29A$^{i}$ | 2.585 (4) | Al10B—Al31B$^{vi}$ | 2.65 (2) |
| Ru1—Al14 | 2.7932 (7) | Al10B—Al23$^{vii}$ | 2.716 (7) |
| Ru2—Si16$^{i}$ | 2.5220 (4) | Al10B—Al23 | 2.716 (7) |
| Ru2—Si16$^{ii}$ | 2.5220 (4) | Al10B—Al22$^{vii}$ | 2.766 (10) |
| Ru2—Al12 | 2.5516 (6) | Al10B—Al22 | 2.766 (10) |
| Ru2—Si18$^{i}$ | 2.5536 (5) | Al11—Al26$^{vii}$ | 2.7287 (7) |
| Ru2—Si18$^{ii}$ | 2.5536 (4) | Al11—Al26 | 2.7288 (7) |
| Ru2—Al28$^{ii}$ | 2.5649 (5) | Al11—Al22$^{vii}$ | 2.7310 (7) |
| Ru2—Al28$^{i}$ | 2.5649 (5) | Al11—Al22 | 2.7310 (7) |
| Ru2—Al20$^{i}$ | 2.6150 (5) | Al11—Al14 | 2.7447 (9) |
| Ru2—Al20$^{ii}$ | 2.6150 (5) | Al12—Si16$^{ii}$ | 2.6025 (5) |
| Ru2—Al14$^{iv}$ | 2.6640 (7) | Al12—Si16$^{i}$ | 2.6025 (5) |
| Ru3—Al15 | 2.3213 (8) | Al12—Si17$^{xii}$ | 2.6263 (6) |
| Ru3—Si19$^{v}$ | 2.4975 (4) | Al12—Si17$^{xiii}$ | 2.6263 (6) |
| Ru3—Si19$^{vi}$ | 2.4975 (4) | Al12—Al14$^{iv}$ | 2.9652 (10) |
| Ru3—Al21$^{vii}$ | 2.5582 (5) | Al13—Si19$^{vii}$ | 2.5792 (7) |
| Ru3—Al21 | 2.5582 (5) | Al13—Si19 | 2.5793 (7) |
| Ru3—Al26$^{v}$ | 2.6041 (5) | Al13—Al27 | 2.6650 (6) |
| Ru3—Al26$^{vi}$ | 2.6041 (5) | Al13—Al27$^{vii}$ | 2.6650 (6) |
| Ru3—Al23$^{vii}$ | 2.6124 (5) | Al13—Al31A | 2.6914 (12) |
| Ru3—Al23 | 2.6124 (5) | Al13—Al31B | 2.896 (6) |
| Ru4A—Al31B | 2.445 (6) | Al13—Al31B$^{vii}$ | 2.896 (6) |
| Ru4A—Al31B$^{vii}$ | 2.445 (6) | Al14—Al30B$^{ii}$ | 2.663 (3) |
| Ru4A—Al15 | 2.479 (3) | Al14—Al30B$^{i}$ | 2.663 (3) |
| Ru4A—Al31C$^{vii}$ | 2.498 (12) | Al14—Al28$^{xi}$ | 2.7563 (7) |
| Ru4A—Al31C | 2.498 (12) | Al14—Al28$^{xiv}$ | 2.7563 (7) |
| Ru4A—Al29B$^{viii}$ | 2.505 (6) | Al14—Al30A$^{ii}$ | 2.7665 (17) |
| Ru4A—Al29B$^{ix}$ | 2.505 (6) | Al14—Al30A$^{i}$ | 2.7665 (16) |
| Ru4A—Al13 | 2.5211 (8) | Al15—Si18$^{viii}$ | 2.5976 (8) |
| Ru4A—Si18$^{ix}$ | 2.541 (2) | Al15—Si18$^{ix}$ | 2.5976 (8) |
| Ru4A—Si18$^{viii}$ | 2.541 (2) | Al15—Al27$^{vii}$ | 2.8406 (7) |
| Ru4A—Al27 | 2.5588 (9) | Al15—Al27 | 2.8406 (7) |
| Ru4A—Al27$^{vii}$ | 2.5588 (9) | Al15—Al21 | 2.8784 (6) |
| Ru4B—Al31B | 2.20 (2) | Al15—Al21$^{vii}$ | 2.8784 (6) |
| Ru4B—Al31B$^{vii}$ | 2.20 (2) | Si16—Si17$^{xv}$ | 2.4623 (6) |
| Ru4B—Al31C$^{vii}$ | 2.28 (2) | Si16—Al20 | 2.5307 (6) |
| Ru4B—Al31C | 2.28 (2) | Si16—Al26$^{vii}$ | 2.6175 (6) |
| Ru4B—Al29B$^{viii}$ | 2.413 (11) | Si16—Al21$^{xvi}$ | 2.6250 (6) |
| Ru4B—Al29B$^{ix}$ | 2.413 (11) | Si16—Al28 | 2.6816 (6) |
| Ru4B—Al31A | 2.44 (2) | Si16—Al25 | 2.7456 (6) |
| Ru4B—Al13 | 2.520 (7) | Si17—Al29A | 2.5512 (15) |
| Ru4B—Al29A$^{viii}$ | 2.529 (7) | Si17—Al23$^{vii}$ | 2.6024 (6) |
| Ru4B—Al29A$^{ix}$ | 2.529 (7) | Si17—Al21$^{vii}$ | 2.6456 (6) |

| | | | |
|---|---|---|---|
| Ru4B—Al27 | 2.632 (8) | Si17—Al30A | 2.659 (3) |
| Ru4B—Al27$^{vii}$ | 2.632 (8) | Si17—Al29B | 2.660 (8) |
| Ru5A—Al10B | 2.352 (9) | Si17—Al25$^{vi}$ | 2.7306 (6) |
| Ru5A—Al32B$^{vi}$ | 2.377 (5) | Si18—Al24$^{vii}$ | 2.5092 (6) |
| Ru5A—Al31C$^{vi}$ | 2.385 (12) | Si18—Al20 | 2.5727 (6) |
| Ru5A—Al32B$^{x}$ | 2.419 (5) | Si18—Al29A | 2.589 (3) |
| Ru5A—Al31B$^{vi}$ | 2.466 (6) | Si18—Al28 | 2.7022 (7) |
| Ru5A—Si19$^{vi}$ | 2.4958 (19) | Si18—Al29B | 2.748 (7) |
| Ru5A—Si10A | 2.499 (4) | Si18—Al27$^{xvii}$ | 2.7785 (6) |
| Ru5A—Si17$^{vii}$ | 2.5395 (19) | Si19—Si19$^{vii}$ | 2.4048 (9) |
| Ru5A—Al29B$^{vii}$ | 2.543 (7) | Si19—Al31A | 2.6552 (12) |
| Ru5A—Al25$^{v}$ | 2.6190 (16) | Si19—Al25$^{vii}$ | 2.6803 (6) |
| Ru5A—Al24 | 2.6311 (14) | Si19—Al23$^{xv}$ | 2.8453 (6) |
| Ru5A—Al29A$^{vii}$ | 2.656 (4) | Si19—Al31B | 2.874 (6) |
| Ru5B—Al32B$^{vi}$ | 2.368 (6) | Al20—Al30A | 2.6202 (10) |
| Ru5B—Al32B$^{x}$ | 2.372 (6) | Al20—Al20$^{xviii}$ | 2.6215 (10) |
| Ru5B—Al29B$^{vii}$ | 2.400 (9) | Al20—Al30B | 2.650 (3) |
| Ru5B—Si17$^{vii}$ | 2.456 (5) | Al20—Al29A | 2.653 (6) |
| Ru5B—Al31C$^{vi}$ | 2.460 (13) | Al20—Al24$^{vii}$ | 2.6549 (7) |
| Ru5B—Al10B | 2.479 (9) | Al20—Al29B | 2.996 (14) |
| Ru5B—Al29A$^{vii}$ | 2.513 (7) | Al21—Al23 | 2.6080 (6) |
| Ru5B—Si19$^{vi}$ | 2.575 (5) | Al21—Al26$^{vi}$ | 2.6350 (6) |
| Ru5B—Al25$^{v}$ | 2.576 (4) | Al21—Al30A$^{vii}$ | 2.764 (3) |
| Ru5B—Al31B$^{vi}$ | 2.578 (8) | Al21—Al28$^{v}$ | 2.7938 (7) |
| Ru5B—Al24 | 2.594 (4) | Al21—Al28$^{viii}$ | 2.9369 (7) |
| Ru5B—Si10A | 2.615 (6) | Al22—Al32A$^{x}$ | 2.6670 (10) |
| Ru6—Si16$^{vii}$ | 2.4926 (4) | Al22—Al24 | 2.6898 (6) |
| Ru6—Si19 | 2.5300 (4) | Al22—Al27$^{x}$ | 2.6996 (7) |
| Ru6—Si8 | 2.5426 (3) | Al22—Al32B$^{x}$ | 2.737 (5) |
| Ru6—Al24 | 2.5715 (5) | Al23—Al24 | 2.7846 (6) |
| Ru6—Al25$^{vii}$ | 2.5898 (5) | Al24—Al29A$^{vii}$ | 2.716 (3) |
| Ru6—Al20$^{vii}$ | 2.6083 (5) | Al24—Al26 | 2.7772 (6) |
| Ru6—Al23 | 2.6367 (5) | Al25—Al32A$^{vii}$ | 2.6586 (8) |
| Ru6—Al13 | 2.6429 (4) | Al25—Al27$^{vii}$ | 2.7200 (7) |
| Ru6—Al26 | 2.7455 (5) | Al25—Al32B$^{vii}$ | 2.738 (4) |
| Ru6—Al27 | 2.7596 (5) | Al26—Al26$^{vii}$ | 2.8388 (10) |
| Ru6—Al30A$^{vii}$ | 2.987 (2) | Al27—Al30A$^{vii}$ | 2.5594 (16) |
| Ru7—Al21$^{x}$ | 2.4760 (5) | Al27—Al32A | 2.6497 (10) |
| Ru7—Al11 | 2.4892 (3) | Al27—Al30B$^{vii}$ | 2.744 (4) |
| Ru7—Si18$^{vii}$ | 2.5655 (5) | Al28—Al28$^{xiv}$ | 2.6519 (10) |
| Ru7—Al30A$^{i}$ | 2.6492 (8) | Al29A—Al32A$^{xvii}$ | 2.551 (5) |
| Ru7—Al27$^{x}$ | 2.7068 (5) | Al29A—Al29A$^{xviii}$ | 2.567 (2) |
| Ru7—Al30B$^{i}$ | 2.711 (3) | Al29A—Al29B$^{xviii}$ | 2.639 (6) |
| Ru7—Al26 | 2.7156 (5) | Al29B—Al32A$^{xvii}$ | 2.229 (14) |
| Ru7—Al28$^{xi}$ | 2.7385 (5) | Al29B—Al31C$^{xvii}$ | 2.507 (19) |
| Ru7—Al24 | 2.7416 (5) | Al29B—Al29B$^{xviii}$ | 2.666 (12) |
| Ru7—Al28$^{vii}$ | 2.8479 (5) | Al29B—Al32B$^{xvii}$ | 2.684 (15) |
| Ru7—Al22 | 2.8669 (5) | Al30A—Al30B | 0.507 (4) |

| | | | |
|---|---|---|---|
| Si8—Si10A | 2.489 (5) | Al30B—Al30B$^{xviii}$ | 2.659 (12) |
| Si8—Al13 | 2.5334 (8) | Al31A—Al31B$^{vii}$ | 0.802 (8) |
| Si8—Al26$^{vii}$ | 2.6404 (7) | Al31A—Al31B | 0.802 (8) |
| Si8—Al26 | 2.6404 (7) | Al31A—Al31C | 1.596 (16) |
| Si8—Al23$^{vii}$ | 2.6744 (7) | Al31A—Al31C$^{vii}$ | 1.596 (16) |
| Si8—Al23 | 2.6744 (7) | Al31A—Al32A$^{vii}$ | 2.5064 (11) |
| Si8—Al11 | 2.7624 (9) | Al31A—Al32A | 2.5064 (11) |
| Si8—Al10B | 2.79 (2) | Al31B—Al31C | 0.808 (15) |
| Si8—Al24$^{vii}$ | 2.8005 (5) | Al31B—Al31B$^{vii}$ | 1.269 (15) |
| Si9A—Si9B | 0.979 (3) | Al31B—Al32A | 1.718 (8) |
| Si9A—Al22$^{vii}$ | 2.5205 (8) | Al31B—Al31C$^{vii}$ | 2.028 (19) |
| Si9A—Al22 | 2.5205 (8) | Al31B—Al32B | 2.229 (9) |
| Si9A—Al12 | 2.5484 (10) | Al31C—Al32A | 0.912 (16) |
| Si9A—Al25$^{ii}$ | 2.5683 (6) | Al31C—Al32B | 1.503 (16) |
| Si9A—Al25$^{i}$ | 2.5683 (6) | Al31C—Al32B$^{xix}$ | 2.223 (15) |
| Si9A—Al30B$^{i}$ | 2.659 (7) | Al31C—Al31C$^{vii}$ | 2.73 (3) |
| Si9A—Al30B$^{ii}$ | 2.659 (7) | Al32A—Al32B | 0.892 (4) |
| Si9B—Al12 | 2.540 (2) | Al32A—Al32B$^{xix}$ | 1.680 (5) |
| Si9B—Al22$^{vii}$ | 2.5812 (19) | Al32A—Al32A$^{xix}$ | 2.5713 (17) |
| Si9B—Al22 | 2.5812 (19) | Al32B—Al32B$^{xix}$ | 0.790 (9) |

| | | | |
|---|---|---|---|
| Si17$^{i}$—Ru1—Si17$^{ii}$ | 127.96 (2) | Ru2$^{ix}$—Si18—Al15$^{ii}$ | 88.28 (2) |
| Si17$^{i}$—Ru1—Al12$^{iii}$ | 64.049 (11) | Ru7$^{vii}$—Si18—Al15$^{ii}$ | 93.755 (17) |
| Si17$^{ii}$—Ru1—Al12$^{iii}$ | 64.049 (11) | Al20—Si18—Al15$^{ii}$ | 142.75 (2) |
| Si17$^{i}$—Ru1—Al20$^{ii}$ | 144.754 (15) | Al29A—Si18—Al15$^{ii}$ | 118.30 (8) |
| Si17$^{ii}$—Ru1—Al20$^{ii}$ | 83.029 (15) | Al24$^{vii}$—Si18—Al28 | 103.52 (2) |
| Al12$^{iii}$—Ru1—Al20$^{ii}$ | 144.381 (13) | Ru4A$^{ii}$—Si18—Al28 | 136.96 (5) |
| Si17$^{i}$—Ru1—Al20$^{i}$ | 83.029 (15) | Ru2$^{ix}$—Si18—Al28 | 58.339 (14) |
| Si17$^{ii}$—Ru1—Al20$^{i}$ | 144.754 (15) | Ru7$^{vii}$—Si18—Al28 | 65.395 (15) |
| Al12$^{iii}$—Ru1—Al20$^{i}$ | 144.381 (14) | Al20—Si18—Al28 | 99.38 (2) |
| Al20$^{ii}$—Ru1—Al20$^{i}$ | 62.92 (2) | Al29A—Si18—Al28 | 160.49 (10) |
| Si17$^{i}$—Ru1—Al30B$^{i}$ | 75.28 (17) | Al15$^{ii}$—Si18—Al28 | 79.54 (2) |
| Si17$^{ii}$—Ru1—Al30B$^{i}$ | 133.55 (13) | Al24$^{vii}$—Si18—Ru4B$^{ii}$ | 112.7 (3) |
| Al12$^{iii}$—Ru1—Al30B$^{i}$ | 116.43 (11) | Ru4A$^{ii}$—Si18—Ru4B$^{ii}$ | 4.2 (3) |
| Al20$^{ii}$—Ru1—Al30B$^{i}$ | 95.71 (13) | Ru2$^{ix}$—Si18—Ru4B$^{ii}$ | 113.67 (18) |
| Al20$^{i}$—Ru1—Al30B$^{i}$ | 63.37 (8) | Ru7$^{vii}$—Si18—Ru4B$^{ii}$ | 117.73 (11) |
| Si17$^{i}$—Ru1—Al30B$^{ii}$ | 133.55 (13) | Al20—Si18—Ru4B$^{ii}$ | 109.0 (2) |
| Si17$^{ii}$—Ru1—Al30B$^{ii}$ | 75.28 (17) | Al29A—Si18—Ru4B$^{ii}$ | 56.7 (3) |
| Al12$^{iii}$—Ru1—Al30B$^{ii}$ | 116.43 (11) | Al15$^{ii}$—Si18—Ru4B$^{ii}$ | 61.8 (3) |
| Al20$^{ii}$—Ru1—Al30B$^{ii}$ | 63.37 (8) | Al28—Si18—Ru4B$^{ii}$ | 141.1 (3) |
| Al20$^{i}$—Ru1—Al30B$^{ii}$ | 95.71 (13) | Al24$^{vii}$—Si18—Al29B | 65.62 (12) |
| Al30B$^{i}$—Ru1—Al30B$^{ii}$ | 63.3 (3) | Ru4A$^{ii}$—Si18—Al29B | 56.4 (2) |
| Si17$^{i}$—Ru1—Al30A$^{i}$ | 64.04 (9) | Ru2$^{ix}$—Si18—Al29B | 117.2 (3) |
| Si17$^{ii}$—Ru1—Al30A$^{i}$ | 141.35 (6) | Ru7$^{vii}$—Si18—Al29B | 114.16 (19) |
| Al12$^{iii}$—Ru1—Al30A$^{i}$ | 110.24 (6) | Al20—Si18—Al29B | 68.5 (3) |
| Al20$^{ii}$—Ru1—Al30A$^{i}$ | 103.90 (7) | Al29A—Si18—Al29B | 6.68 (19) |
| Al20$^{i}$—Ru1—Al30A$^{i}$ | 62.12 (2) | Al15$^{ii}$—Si18—Al29B | 114.0 (2) |
| Al30B$^{i}$—Ru1—Al30A$^{i}$ | 11.38 (9) | Al28—Si18—Al29B | 166.2 (2) |

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| Al30B$^{ii}$—Ru1—Al30A$^{i}$ | 74.4 (3) | Ru4B$^{ii}$—Si18—Al29B | 52.3 (4) |
| Si17$^{i}$—Ru1—Al30A$^{ii}$ | 141.35 (6) | Al24$^{vii}$—Si18—Al27$^{xvii}$ | 91.53 (2) |
| Si17$^{ii}$—Ru1—Al30A$^{ii}$ | 64.04 (9) | Ru4A$^{ii}$—Si18—Al27$^{xvii}$ | 57.299 (16) |
| Al12$^{iii}$—Ru1—Al30A$^{ii}$ | 110.24 (6) | Ru2$^{ix}$—Si18—Al27$^{xvii}$ | 151.80 (2) |
| Al20$^{ii}$—Ru1—Al30A$^{ii}$ | 62.12 (2) | Ru7$^{vii}$—Si18—Al27$^{xvii}$ | 60.707 (14) |
| Al20$^{i}$—Ru1—Al30A$^{ii}$ | 103.90 (7) | Al20—Si18—Al27$^{xvii}$ | 145.13 (2) |
| Al30B$^{i}$—Ru1—Al30A$^{ii}$ | 74.4 (3) | Al29A—Si18—Al27$^{xvii}$ | 86.36 (11) |
| Al30B$^{ii}$—Ru1—Al30A$^{ii}$ | 11.38 (9) | Al15$^{ii}$—Si18—Al27$^{xvii}$ | 63.69 (2) |
| Al30A$^{i}$—Ru1—Al30A$^{ii}$ | 85.39 (18) | Al28—Si18—Al27$^{xvii}$ | 110.06 (2) |
| Si17$^{i}$—Ru1—Al29A$^{ii}$ | 113.93 (8) | Ru4B$^{ii}$—Si18—Al27$^{xvii}$ | 57.10 (11) |
| Si17$^{ii}$—Ru1—Al29A$^{ii}$ | 60.88 (3) | Al29B—Si18—Al27$^{xvii}$ | 79.7 (3) |
| Al12$^{iii}$—Ru1—Al29A$^{ii}$ | 88.24 (10) | Si19$^{vii}$—Si19—Ru5A$^{xv}$ | 114.07 (6) |
| Al20$^{ii}$—Ru1—Al29A$^{ii}$ | 62.72 (10) | Si19$^{vii}$—Si19—Ru3$^{xv}$ | 61.220 (10) |
| Al20$^{i}$—Ru1—Al29A$^{ii}$ | 93.44 (7) | Ru5A$^{xv}$—Si19—Ru3$^{xv}$ | 117.82 (4) |
| Al30B$^{i}$—Ru1—Al29A$^{ii}$ | 154.64 (12) | Si19$^{vii}$—Si19—Ru6 | 114.396 (10) |
| Al30B$^{ii}$—Ru1—Al29A$^{ii}$ | 112.49 (16) | Ru5A$^{xv}$—Si19—Ru6 | 120.02 (5) |
| Al30A$^{i}$—Ru1—Al29A$^{ii}$ | 155.48 (6) | Ru3$^{xv}$—Si19—Ru6 | 115.378 (16) |
| Al30A$^{ii}$—Ru1—Al29A$^{ii}$ | 103.68 (10) | Si19$^{vii}$—Si19—Ru5B$^{xv}$ | 116.81 (12) |
| Si17$^{i}$—Ru1—Al29A$^{i}$ | 60.88 (3) | Ru5A$^{xv}$—Si19—Ru5B$^{xv}$ | 2.78 (10) |
| Si17$^{ii}$—Ru1—Al29A$^{i}$ | 113.93 (8) | Ru3$^{xv}$—Si19—Ru5B$^{xv}$ | 118.33 (8) |
| Al12$^{iii}$—Ru1—Al29A$^{i}$ | 88.24 (10) | Ru6—Si19—Ru5B$^{xv}$ | 118.15 (10) |
| Al20$^{ii}$—Ru1—Al29A$^{i}$ | 93.44 (7) | Si19$^{vii}$—Si19—Al13 | 62.212 (12) |
| Al20$^{i}$—Ru1—Al29A$^{i}$ | 62.72 (10) | Ru5A$^{xv}$—Si19—Al13 | 116.28 (4) |
| Al30B$^{i}$—Ru1—Al29A$^{i}$ | 112.49 (15) | Ru3$^{xv}$—Si19—Al13 | 112.756 (19) |
| Al30B$^{ii}$—Ru1—Al29A$^{i}$ | 154.64 (12) | Ru6—Si19—Al13 | 62.290 (14) |
| Al30A$^{i}$—Ru1—Al29A$^{i}$ | 103.68 (10) | Ru5B$^{xv}$—Si19—Al13 | 117.66 (10) |
| Al30A$^{ii}$—Ru1—Al29A$^{i}$ | 155.48 (6) | Si19$^{vii}$—Si19—Al31A | 63.073 (15) |
| Al29A$^{ii}$—Ru1—Al29A$^{i}$ | 59.54 (7) | Ru5A$^{xv}$—Si19—Al31A | 62.54 (5) |
| Si17$^{i}$—Ru1—Al14 | 82.158 (12) | Ru3$^{xv}$—Si19—Al31A | 116.05 (2) |
| Si17$^{ii}$—Ru1—Al14 | 82.158 (12) | Ru6—Si19—Al31A | 114.28 (3) |
| Al12$^{iii}$—Ru1—Al14 | 67.80 (2) | Ru5B$^{xv}$—Si19—Al31A | 65.01 (12) |
| Al20$^{ii}$—Ru1—Al14 | 123.122 (17) | Al13—Si19—Al31A | 61.86 (3) |
| Al20$^{i}$—Ru1—Al14 | 123.122 (17) | Si19$^{vii}$—Si19—Al25$^{vii}$ | 149.448 (13) |
| Al30B$^{i}$—Ru1—Al14 | 59.76 (8) | Ru5A$^{xv}$—Si19—Al25$^{vii}$ | 60.67 (5) |
| Al30B$^{ii}$—Ru1—Al14 | 59.76 (8) | Ru3$^{xv}$—Si19—Al25$^{vii}$ | 149.29 (2) |
| Al30A$^{i}$—Ru1—Al14 | 61.99 (3) | Ru6—Si19—Al25$^{vii}$ | 59.526 (14) |
| Al30A$^{ii}$—Ru1—Al14 | 61.99 (3) | Ru5B$^{xv}$—Si19—Al25$^{vii}$ | 58.67 (10) |
| Al29A$^{ii}$—Ru1—Al14 | 142.33 (5) | Al13—Si19—Al25$^{vii}$ | 92.054 (18) |
| Al29A$^{i}$—Ru1—Al14 | 142.33 (5) | Al31A—Si19—Al25$^{vii}$ | 91.10 (2) |
| Si16$^{i}$—Ru2—Si16$^{ii}$ | 123.36 (2) | Si19$^{vii}$—Si19—Al23$^{xv}$ | 94.905 (13) |
| Si16$^{i}$—Ru2—Al12 | 61.718 (10) | Ru5A$^{xv}$—Si19—Al23$^{xv}$ | 61.08 (3) |
| Si16$^{ii}$—Ru2—Al12 | 61.718 (10) | Ru3$^{xv}$—Si19—Al23$^{xv}$ | 58.108 (13) |
| Si16$^{i}$—Ru2—Si18$^{i}$ | 81.434 (14) | Ru6—Si19—Al23$^{xv}$ | 142.54 (2) |
| Si16$^{ii}$—Ru2—Si18$^{i}$ | 147.022 (15) | Ru5B$^{xv}$—Si19—Al23$^{xv}$ | 61.03 (8) |
| Al12—Ru2—Si18$^{i}$ | 138.220 (13) | Al13—Si19—Al23$^{xv}$ | 154.71 (2) |
| Si16$^{i}$—Ru2—Si18$^{ii}$ | 147.022 (15) | Al31A—Si19—Al23$^{xv}$ | 99.30 (3) |
| Si16$^{ii}$—Ru2—Si18$^{ii}$ | 81.434 (14) | Al25$^{vii}$—Si19—Al23$^{xv}$ | 105.80 (2) |
| Al12—Ru2—Si18$^{ii}$ | 138.220 (13) | Si19$^{vii}$—Si19—Al31B | 78.60 (16) |

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| Si18$^{i}$—Ru2—Si18$^{ii}$ | 68.26 (2) | Ru5A$^{xv}$—Si19—Al31B | 54.13 (13) |
| Si16$^{i}$—Ru2—Al28$^{ii}$ | 143.769 (17) | Ru3$^{xv}$—Si19—Al31B | 131.36 (16) |
| Si16$^{ii}$—Ru2—Al28$^{ii}$ | 63.620 (15) | Ru6—Si19—Al31B | 105.19 (13) |
| Al12—Ru2—Al28$^{ii}$ | 110.636 (16) | Ru5B$^{xv}$—Si19—Al31B | 56.15 (17) |
| Si18$^{i}$—Ru2—Al28$^{ii}$ | 110.775 (16) | Al13—Si19—Al31B | 63.90 (11) |
| Si18$^{ii}$—Ru2—Al28$^{ii}$ | 63.730 (15) | Al31A—Si19—Al31B | 16.07 (16) |
| Si16$^{i}$—Ru2—Al28$^{i}$ | 63.620 (15) | Al25$^{vii}$—Si19—Al31B | 75.04 (16) |
| Si16$^{ii}$—Ru2—Al28$^{i}$ | 143.769 (17) | Al23$^{xv}$—Si19—Al31B | 103.02 (11) |
| Al12—Ru2—Al28$^{i}$ | 110.636 (16) | Ru1$^{ix}$—Al20—Si16 | 162.93 (2) |
| Si18$^{i}$—Ru2—Al28$^{i}$ | 63.730 (15) | Ru1$^{ix}$—Al20—Si18 | 111.67 (2) |
| Si18$^{ii}$—Ru2—Al28$^{i}$ | 110.775 (16) | Si16—Al20—Si18 | 80.894 (18) |
| Al28$^{ii}$—Ru2—Al28$^{i}$ | 90.55 (2) | Ru1$^{ix}$—Al20—Ru6$^{vii}$ | 125.197 (19) |
| Si16$^{i}$—Ru2—Al20$^{i}$ | 58.997 (14) | Si16—Al20—Ru6$^{vii}$ | 58.004 (14) |
| Si16$^{ii}$—Ru2—Al20$^{i}$ | 111.555 (15) | Si18—Al20—Ru6$^{vii}$ | 105.61 (2) |
| Al12—Ru2—Al20$^{i}$ | 83.470 (17) | Ru1$^{ix}$—Al20—Ru2$^{ix}$ | 116.882 (18) |
| Si18$^{i}$—Ru2—Al20$^{i}$ | 59.691 (15) | Si16—Al20—Ru2$^{ix}$ | 58.669 (14) |
| Si18$^{ii}$—Ru2—Al20$^{i}$ | 93.313 (15) | Si18—Al20—Ru2$^{ix}$ | 58.968 (14) |
| Al28$^{ii}$—Ru2—Al20$^{i}$ | 156.733 (17) | Ru6$^{vii}$—Al20—Ru2$^{ix}$ | 116.420 (18) |
| Al28$^{i}$—Ru2—Al20$^{i}$ | 101.912 (16) | Ru1$^{ix}$—Al20—Al30A | 59.97 (3) |
| Si16$^{i}$—Ru2—Al20$^{ii}$ | 111.555 (15) | Si16—Al20—Al30A | 112.80 (3) |
| Si16$^{ii}$—Ru2—Al20$^{ii}$ | 58.997 (14) | Si18—Al20—Al30A | 156.41 (9) |
| Al12—Ru2—Al20$^{ii}$ | 83.470 (17) | Ru6$^{vii}$—Al20—Al30A | 69.68 (6) |
| Si18$^{i}$—Ru2—Al20$^{ii}$ | 93.313 (15) | Ru2$^{ix}$—Al20—Al30A | 144.39 (9) |
| Si18$^{ii}$—Ru2—Al20$^{ii}$ | 59.691 (15) | Ru1$^{ix}$—Al20—Al20$^{xviii}$ | 58.538 (11) |
| Al28$^{ii}$—Ru2—Al20$^{ii}$ | 101.912 (16) | Si16—Al20—Al20$^{xviii}$ | 111.059 (14) |
| Al28$^{i}$—Ru2—Al20$^{ii}$ | 156.733 (17) | Si18—Al20—Al20$^{xviii}$ | 92.718 (15) |
| Al20$^{i}$—Ru2—Al20$^{ii}$ | 60.16 (2) | Ru6$^{vii}$—Al20—Al20$^{xviii}$ | 155.712 (11) |
| Si16$^{i}$—Ru2—Al14$^{iv}$ | 81.602 (12) | Ru2$^{ix}$—Al20—Al20$^{xviii}$ | 59.918 (10) |
| Si16$^{ii}$—Ru2—Al14$^{iv}$ | 81.602 (12) | Al30A—Al20—Al20$^{xviii}$ | 99.43 (8) |
| Al12—Ru2—Al14$^{iv}$ | 69.26 (2) | Ru1$^{ix}$—Al20—Al30B | 58.73 (7) |
| Si18$^{i}$—Ru2—Al14$^{iv}$ | 126.881 (15) | Si16—Al20—Al30B | 110.92 (8) |
| Si18$^{ii}$—Ru2—Al14$^{iv}$ | 126.881 (15) | Si18—Al20—Al30B | 165.71 (13) |
| Al28$^{ii}$—Ru2—Al14$^{iv}$ | 63.592 (15) | Ru6$^{vii}$—Al20—Al30B | 75.79 (10) |
| Al28$^{i}$—Ru2—Al14$^{iv}$ | 63.592 (15) | Ru2$^{ix}$—Al20—Al30B | 133.67 (16) |
| Al20$^{i}$—Ru2—Al14$^{iv}$ | 139.634 (15) | Al30A—Al20—Al30B | 11.01 (8) |
| Al20$^{ii}$—Ru2—Al14$^{iv}$ | 139.634 (15) | Al20$^{xviii}$—Al20—Al30B | 90.41 (13) |
| Al15—Ru3—Si19$^{v}$ | 146.524 (15) | Ru1$^{ix}$—Al20—Al29A | 60.00 (3) |
| Al15—Ru3—Si19$^{vi}$ | 146.524 (15) | Si16—Al20—Al29A | 136.44 (3) |
| Si19$^{v}$—Ru3—Si19$^{vi}$ | 57.56 (2) | Si18—Al20—Al29A | 59.37 (3) |
| Al15—Ru3—Al21$^{vii}$ | 72.113 (11) | Ru6$^{vii}$—Al20—Al29A | 113.50 (3) |
| Si19$^{v}$—Ru3—Al21$^{vii}$ | 79.846 (14) | Ru2$^{ix}$—Al20—Al29A | 107.50 (3) |
| Si19$^{vi}$—Ru3—Al21$^{vii}$ | 137.403 (15) | Al30A—Al20—Al29A | 100.36 (6) |
| Al15—Ru3—Al21 | 72.112 (11) | Al20$^{xviii}$—Al20—Al29A | 89.41 (3) |
| Si19$^{v}$—Ru3—Al21 | 137.404 (15) | Al30B—Al20—Al29A | 106.75 (11) |
| Si19$^{vi}$—Ru3—Al21 | 79.847 (14) | Ru1$^{ix}$—Al20—Al24$^{vii}$ | 113.26 (2) |
| Al21$^{vii}$—Ru3—Al21 | 142.73 (2) | Si16—Al20—Al24$^{vii}$ | 83.043 (19) |
| Al15—Ru3—Al26$^{v}$ | 109.98 (2) | Si18—Al20—Al24$^{vii}$ | 57.344 (17) |
| Si19$^{v}$—Ru3—Al26$^{v}$ | 70.039 (14) | Ru6$^{vii}$—Al20—Al24$^{vii}$ | 58.487 (14) |

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| Si19$^{vi}$—Ru3—Al26$^{v}$ | 100.573 (15) | Ru2$^{ix}$—Al20—Al24$^{vii}$ | 108.797 (19) |
| Al21$^{vii}$—Ru3—Al26$^{v}$ | 61.378 (15) | Al30A—Al20—Al24$^{vii}$ | 103.75 (9) |
| Al21—Ru3—Al26$^{v}$ | 123.640 (16) | Al20$^{xviii}$—Al20—Al24$^{vii}$ | 145.427 (14) |
| Al15—Ru3—Al26$^{vi}$ | 109.98 (2) | Al30B—Al20—Al24$^{vii}$ | 114.60 (16) |
| Si19$^{v}$—Ru3—Al26$^{vi}$ | 100.573 (15) | Al29A—Al20—Al24$^{vii}$ | 61.56 (3) |
| Si19$^{vi}$—Ru3—Al26$^{vi}$ | 70.039 (14) | Ru1$^{ix}$—Al20—Al29B | 61.22 (13) |
| Al21$^{vii}$—Ru3—Al26$^{vi}$ | 123.640 (16) | Si16—Al20—Al29B | 135.26 (13) |
| Al21—Ru3—Al26$^{vi}$ | 61.378 (15) | Si18—Al20—Al29B | 58.55 (11) |
| Al26$^{v}$—Ru3—Al26$^{vi}$ | 66.06 (2) | Ru6$^{vii}$—Al20—Al29B | 112.61 (11) |
| Al15—Ru3—Al23$^{vii}$ | 82.61 (2) | Ru2$^{ix}$—Al20—Al29B | 107.37 (10) |
| Si19$^{v}$—Ru3—Al23$^{vii}$ | 67.631 (14) | Al30A—Al20—Al29B | 100.96 (12) |
| Si19$^{vi}$—Ru3—Al23$^{vii}$ | 98.759 (15) | Al20$^{xviii}$—Al20—Al29B | 90.42 (11) |
| Al21$^{vii}$—Ru3—Al23$^{vii}$ | 60.570 (14) | Al30B—Al20—Al29B | 107.52 (16) |
| Al21—Ru3—Al23$^{vii}$ | 123.873 (15) | Al29A—Al20—Al29B | 1.27 (13) |
| Al26$^{v}$—Ru3—Al23$^{vii}$ | 111.863 (15) | Al24$^{vii}$—Al20—Al29B | 60.35 (12) |
| Al26$^{vi}$—Ru3—Al23$^{vii}$ | 167.327 (15) | Ru7$^{xx}$—Al21—Ru3 | 137.97 (2) |
| Al15—Ru3—Al23 | 82.61 (2) | Ru7$^{xx}$—Al21—Al23 | 123.35 (2) |
| Si19$^{v}$—Ru3—Al23 | 98.760 (15) | Ru3—Al21—Al23 | 60.742 (15) |
| Si19$^{vi}$—Ru3—Al23 | 67.632 (14) | Ru7$^{xx}$—Al21—Si16$^{v}$ | 113.707 (19) |
| Al21$^{vii}$—Ru3—Al23 | 123.873 (16) | Ru3—Al21—Si16$^{v}$ | 103.294 (18) |
| Al21—Ru3—Al23 | 60.570 (14) | Al23—Al21—Si16$^{v}$ | 104.90 (2) |
| Al26$^{v}$—Ru3—Al23 | 167.328 (15) | Ru7$^{xx}$—Al21—Al26$^{vi}$ | 123.77 (2) |
| Al26$^{vi}$—Ru3—Al23 | 111.862 (15) | Ru3—Al21—Al26$^{vi}$ | 60.167 (15) |
| Al23$^{vii}$—Ru3—Al23 | 67.20 (2) | Al23—Al21—Al26$^{vi}$ | 111.01 (2) |
| Al31B—Ru4A—Al31B$^{vii}$ | 30.1 (4) | Si16$^{v}$—Al21—Al26$^{vi}$ | 59.684 (17) |
| Al31B—Ru4A—Al15 | 141.68 (13) | Ru7$^{xx}$—Al21—Si17$^{vii}$ | 113.06 (2) |
| Al31B$^{vii}$—Ru4A—Al15 | 141.68 (13) | Ru3—Al21—Si17$^{vii}$ | 103.791 (18) |
| Al31B—Ru4A—Al31C$^{vii}$ | 48.4 (5) | Al23—Al21—Si17$^{vii}$ | 59.380 (16) |
| Al31B$^{vii}$—Ru4A—Al31C$^{vii}$ | 18.8 (3) | Si16$^{v}$—Al21—Si17$^{vii}$ | 55.701 (16) |
| Al15—Ru4A—Al31C$^{vii}$ | 136.5 (3) | Al26$^{vi}$—Al21—Si17$^{vii}$ | 105.59 (2) |
| Al31B—Ru4A—Al31C | 18.8 (3) | Ru7$^{xx}$—Al21—Al30A$^{vii}$ | 60.44 (5) |
| Al31B$^{vii}$—Ru4A—Al31C | 48.4 (5) | Ru3—Al21—Al30A$^{vii}$ | 132.37 (5) |
| Al15—Ru4A—Al31C | 136.5 (3) | Al23—Al21—Al30A$^{vii}$ | 73.48 (6) |
| Al31C$^{vii}$—Ru4A—Al31C | 66.2 (7) | Si16$^{v}$—Al21—Al30A$^{vii}$ | 100.28 (3) |
| Al31B—Ru4A—Al29B$^{viii}$ | 72.6 (4) | Al26$^{vi}$—Al21—Al30A$^{vii}$ | 159.92 (3) |
| Al31B$^{vii}$—Ru4A—Al29B$^{viii}$ | 88.7 (3) | Si17$^{vii}$—Al21—Al30A$^{vii}$ | 58.84 (3) |
| Al15—Ru4A—Al29B$^{viii}$ | 128.2 (2) | Ru7$^{xx}$—Al21—Al28$^{v}$ | 62.275 (15) |
| Al31C$^{vii}$—Ru4A—Al29B$^{viii}$ | 94.8 (3) | Ru3—Al21—Al28$^{v}$ | 129.35 (2) |
| Al31C—Ru4A—Al29B$^{viii}$ | 60.1 (4) | Al23—Al21—Al28$^{v}$ | 161.21 (2) |
| Al31B—Ru4A—Al29B$^{ix}$ | 88.7 (3) | Si16$^{v}$—Al21—Al28$^{v}$ | 59.224 (16) |
| Al31B$^{vii}$—Ru4A—Al29B$^{ix}$ | 72.6 (4) | Al26$^{vi}$—Al21—Al28$^{v}$ | 71.198 (18) |
| Al15—Ru4A—Al29B$^{ix}$ | 128.2 (2) | Si17$^{vii}$—Al21—Al28$^{v}$ | 101.86 (2) |
| Al31C$^{vii}$—Ru4A—Al29B$^{ix}$ | 60.1 (4) | Al30A$^{vii}$—Al21—Al28$^{v}$ | 98.28 (5) |
| Al31C—Ru4A—Al29B$^{ix}$ | 94.8 (3) | Ru7$^{xx}$—Al21—Al15 | 89.143 (19) |
| Al29B$^{viii}$—Ru4A—Al29B$^{ix}$ | 64.3 (3) | Ru3—Al21—Al15 | 50.129 (15) |
| Al31B—Ru4A—Al13 | 71.34 (15) | Al23—Al21—Al15 | 72.82 (2) |
| Al31B$^{vii}$—Ru4A—Al13 | 71.34 (15) | Si16$^{v}$—Al21—Al15 | 151.61 (2) |
| Al15—Ru4A—Al13 | 73.69 (5) | Al26$^{vi}$—Al21—Al15 | 94.05 (2) |

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| Al31C$^{vii}$—Ru4A—Al13 | 78.6 (3) | Si17$^{vii}$—Al21—Al15 | 132.05 (3) |
| Al31C—Ru4A—Al13 | 78.6 (3) | Al30A$^{vii}$—Al21—Al15 | 105.85 (3) |
| Al29B$^{viii}$—Ru4A—Al13 | 136.8 (3) | Al28$^{v}$—Al21—Al15 | 125.96 (3) |
| Al29B$^{ix}$—Ru4A—Al13 | 136.8 (3) | Ru7$^{xx}$—Al21—Al28$^{viii}$ | 62.811 (15) |
| Al31B—Ru4A—Si18$^{ix}$ | 153.56 (16) | Ru3—Al21—Al28$^{viii}$ | 90.535 (18) |
| Al31B$^{vii}$—Ru4A—Si18$^{ix}$ | 127.1 (2) | Al23—Al21—Al28$^{viii}$ | 143.52 (2) |
| Al15—Ru4A—Si18$^{ix}$ | 62.31 (7) | Si16$^{v}$—Al21—Al28$^{viii}$ | 103.27 (2) |
| Al31C$^{vii}$—Ru4A—Si18$^{ix}$ | 108.4 (4) | Al26$^{vi}$—Al21—Al28$^{viii}$ | 65.378 (17) |
| Al31C—Ru4A—Si18$^{ix}$ | 158.6 (3) | Si17$^{vii}$—Al21—Al28$^{viii}$ | 156.51 (2) |
| Al29B$^{viii}$—Ru4A—Si18$^{ix}$ | 101.1 (3) | Al30A$^{vii}$—Al21—Al28$^{viii}$ | 123.23 (5) |
| Al29B$^{ix}$—Ru4A—Si18$^{ix}$ | 66.0 (2) | Al28$^{v}$—Al21—Al28$^{viii}$ | 55.06 (2) |
| Al13—Ru4A—Si18$^{ix}$ | 121.64 (8) | Al15—Al21—Al28$^{viii}$ | 71.34 (2) |
| Al31B—Ru4A—Si18$^{viii}$ | 127.1 (2) | Si9A—Al22—Si9B | 22.09 (6) |
| Al31B$^{vii}$—Ru4A—Si18$^{viii}$ | 153.56 (16) | Si9A—Al22—Ru5A | 130.73 (6) |
| Al15—Ru4A—Si18$^{viii}$ | 62.31 (7) | Si9B—Al22—Ru5A | 108.84 (7) |
| Al31C$^{vii}$—Ru4A—Si18$^{viii}$ | 158.6 (3) | Si9A—Al22—Si10A | 103.32 (3) |
| Al31C—Ru4A—Si18$^{viii}$ | 108.4 (4) | Si9B—Al22—Si10A | 93.38 (8) |
| Al29B$^{viii}$—Ru4A—Si18$^{viii}$ | 66.0 (2) | Ru5A—Al22—Si10A | 56.05 (10) |
| Al29B$^{ix}$—Ru4A—Si18$^{viii}$ | 101.1 (3) | Si9A—Al22—Al32A$^{x}$ | 111.57 (3) |
| Al13—Ru4A—Si18$^{viii}$ | 121.64 (8) | Si9B—Al22—Al32A$^{x}$ | 100.13 (4) |
| Si18$^{ix}$—Ru4A—Si18$^{viii}$ | 68.65 (6) | Ru5A—Al22—Al32A$^{x}$ | 61.66 (6) |
| Al31B—Ru4A—Al27 | 81.93 (16) | Si10A—Al22—Al32A$^{x}$ | 117.32 (9) |
| Al31B$^{vii}$—Ru4A—Al27 | 107.8 (2) | Si9A—Al22—Ru5B | 132.98 (12) |
| Al15—Ru4A—Al27 | 68.62 (6) | Si9B—Al22—Ru5B | 110.98 (13) |
| Al31C$^{vii}$—Ru4A—Al27 | 125.6 (4) | Ru5A—Al22—Ru5B | 3.10 (10) |
| Al31C—Ru4A—Al27 | 69.2 (3) | Si10A—Al22—Ru5B | 58.60 (13) |
| Al29B$^{viii}$—Ru4A—Al27 | 88.75 (18) | Al32A$^{x}$—Al22—Ru5B | 59.40 (10) |
| Al29B$^{ix}$—Ru4A—Al27 | 153.02 (17) | Si9A—Al22—Al24 | 158.31 (3) |
| Al13—Ru4A—Al27 | 63.279 (16) | Si9B—Al22—Al24 | 157.71 (5) |
| Si18$^{ix}$—Ru4A—Al27 | 124.15 (11) | Ru5A—Al22—Al24 | 58.96 (3) |
| Si18$^{viii}$—Ru4A—Al27 | 66.03 (4) | Si10A—Al22—Al24 | 64.35 (6) |
| Al31B—Ru4A—Al27$^{vii}$ | 107.8 (2) | Al32A$^{x}$—Al22—Al24 | 90.11 (2) |
| Al31B$^{vii}$—Ru4A—Al27$^{vii}$ | 81.93 (16) | Ru5B—Al22—Al24 | 57.77 (10) |
| Al15—Ru4A—Al27$^{vii}$ | 68.62 (6) | Si9A—Al22—Al27$^{x}$ | 101.59 (2) |
| Al31C$^{vii}$—Ru4A—Al27$^{vii}$ | 69.2 (3) | Si9B—Al22—Al27$^{x}$ | 112.79 (4) |
| Al31C—Ru4A—Al27$^{vii}$ | 125.6 (4) | Ru5A—Al22—Al27$^{x}$ | 111.30 (7) |
| Al29B$^{viii}$—Ru4A—Al27$^{vii}$ | 153.02 (17) | Si10A—Al22—Al27$^{x}$ | 153.82 (6) |
| Al29B$^{ix}$—Ru4A—Al27$^{vii}$ | 88.75 (18) | Al32A$^{x}$—Al22—Al27$^{x}$ | 59.17 (2) |
| Al13—Ru4A—Al27$^{vii}$ | 63.280 (16) | Ru5B—Al22—Al27$^{x}$ | 108.24 (13) |
| Si18$^{ix}$—Ru4A—Al27$^{vii}$ | 66.03 (4) | Al24—Al22—Al27$^{x}$ | 89.47 (2) |
| Si18$^{viii}$—Ru4A—Al27$^{vii}$ | 124.15 (11) | Si9A—Al22—Al11 | 90.74 (3) |
| Al27—Ru4A—Al27$^{vii}$ | 118.19 (6) | Si9B—Al22—Al11 | 103.79 (4) |
| Al31B—Ru4B—Al31B$^{vii}$ | 33.6 (5) | Ru5A—Al22—Al11 | 110.59 (4) |
| Al31B—Ru4B—Al31C$^{vii}$ | 53.9 (7) | Si10A—Al22—Al11 | 62.61 (12) |
| Al31B$^{vii}$—Ru4B—Al31C$^{vii}$ | 20.7 (4) | Al32A$^{x}$—Al22—Al11 | 156.05 (3) |
| Al31B—Ru4B—Al31C | 20.7 (4) | Ru5B—Al22—Al11 | 111.75 (8) |
| Al31B$^{vii}$—Ru4B—Al31C | 53.9 (7) | Al24—Al22—Al11 | 67.886 (18) |
| Al31C$^{vii}$—Ru4B—Al31C | 73.5 (10) | Al27$^{x}$—Al22—Al11 | 109.29 (2) |

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| Al31B—Ru4B—Al29B$^{viii}$ | 78.9 (6) | Si9A—Al22—Al32B$^{x}$ | 103.33 (10) |
| Al31B$^{vii}$—Ru4B—Al29B$^{viii}$ | 97.3 (8) | Si9B—Al22—Al32B$^{x}$ | 87.15 (11) |
| Al31C$^{vii}$—Ru4B—Al29B$^{viii}$ | 103.3 (8) | Ru5A—Al22—Al32B$^{x}$ | 53.28 (10) |
| Al31C—Ru4B—Al29B$^{viii}$ | 64.5 (6) | Si10A—Al22—Al32B$^{x}$ | 104.81 (14) |
| Al31B—Ru4B—Al29B$^{ix}$ | 97.3 (8) | Al32A$^{x}$—Al22—Al32B$^{x}$ | 18.94 (9) |
| Al31B$^{vii}$—Ru4B—Al29B$^{ix}$ | 78.9 (6) | Ru5B—Al22—Al32B$^{x}$ | 51.91 (12) |
| Al31C$^{vii}$—Ru4B—Al29B$^{ix}$ | 64.5 (6) | Al24—Al22—Al32B$^{x}$ | 97.29 (10) |
| Al31C—Ru4B—Al29B$^{ix}$ | 103.3 (8) | Al27$^{x}$—Al22—Al32B$^{x}$ | 76.92 (10) |
| Al29B$^{viii}$—Ru4B—Al29B$^{ix}$ | 67.1 (5) | Al11—Al22—Al32B$^{x}$ | 163.34 (9) |
| Al31B—Ru4B—Al31A | 19.0 (3) | Si9A—Al22—Al10B | 101.92 (15) |
| Al31B$^{vii}$—Ru4B—Al31A | 19.0 (3) | Si9B—Al22—Al10B | 89.6 (3) |
| Al31C$^{vii}$—Ru4B—Al31A | 39.4 (5) | Ru5A—Al22—Al10B | 51.4 (3) |
| Al31C—Ru4B—Al31A | 39.4 (5) | Si10A—Al22—Al10B | 7.7 (4) |
| Al29B$^{viii}$—Ru4B—Al31A | 95.5 (7) | Al32A$^{x}$—Al22—Al10B | 111.6 (4) |
| Al29B$^{ix}$—Ru4B—Al31A | 95.5 (7) | Ru5B—Al22—Al10B | 54.1 (3) |
| Al31B—Ru4B—Al13 | 75.4 (4) | Al24—Al22—Al10B | 68.2 (3) |
| Al31B$^{vii}$—Ru4B—Al13 | 75.4 (4) | Al27$^{x}$—Al22—Al10B | 156.49 (16) |
| Al31C$^{vii}$—Ru4B—Al13 | 82.8 (5) | Al11—Al22—Al10B | 70.0 (5) |
| Al31C—Ru4B—Al13 | 82.8 (5) | Al32B$^{x}$—Al22—Al10B | 98.0 (4) |
| Al29B$^{viii}$—Ru4B—Al13 | 142.6 (5) | Si17$^{vii}$—Al23—Al21 | 61.029 (17) |
| Al29B$^{ix}$—Ru4B—Al13 | 142.6 (5) | Si17$^{vii}$—Al23—Ru3 | 103.499 (18) |
| Al31A—Ru4B—Al13 | 65.7 (3) | Al21—Al23—Ru3 | 58.687 (14) |
| Al31B—Ru4B—Al29A$^{viii}$ | 86.4 (6) | Si17$^{vii}$—Al23—Ru6 | 100.099 (19) |
| Al31B$^{vii}$—Ru4B—Al29A$^{viii}$ | 103.4 (8) | Al21—Al23—Ru6 | 109.94 (2) |
| Al31C$^{vii}$—Ru4B—Al29A$^{viii}$ | 107.4 (8) | Ru3—Al23—Ru6 | 141.414 (19) |
| Al31C—Ru4B—Al29A$^{viii}$ | 72.1 (5) | Si17$^{vii}$—Al23—Si8 | 141.88 (2) |
| Al29B$^{viii}$—Ru4B—Al29A$^{viii}$ | 7.6 (2) | Al21—Al23—Si8 | 150.82 (2) |
| Al29B$^{ix}$—Ru4B—Al29A$^{viii}$ | 64.5 (3) | Ru3—Al23—Si8 | 112.858 (19) |
| Al31A—Ru4B—Al29A$^{viii}$ | 102.8 (7) | Ru6—Al23—Si8 | 57.201 (13) |
| Al13—Ru4B—Al29A$^{viii}$ | 148.2 (3) | Si17$^{vii}$—Al23—Al10B | 107.7 (3) |
| Al31B—Ru4B—Al29A$^{ix}$ | 103.4 (8) | Al21—Al23—Al10B | 139.1 (5) |
| Al31B$^{vii}$—Ru4B—Al29A$^{ix}$ | 86.4 (6) | Ru3—Al23—Al10B | 90.5 (4) |
| Al31C$^{vii}$—Ru4B—Al29A$^{ix}$ | 72.1 (5) | Ru6—Al23—Al10B | 110.8 (5) |
| Al31C—Ru4B—Al29A$^{ix}$ | 107.4 (8) | Si8—Al23—Al10B | 62.3 (5) |
| Al29B$^{viii}$—Ru4B—Al29A$^{ix}$ | 64.5 (3) | Si17$^{vii}$—Al23—Si10A | 111.40 (6) |
| Al29B$^{ix}$—Ru4B—Al29A$^{ix}$ | 7.6 (2) | Al21—Al23—Si10A | 146.97 (12) |
| Al31A—Ru4B—Al29A$^{ix}$ | 102.8 (7) | Ru3—Al23—Si10A | 96.25 (9) |
| Al13—Ru4B—Al29A$^{ix}$ | 148.2 (3) | Ru6—Al23—Si10A | 103.01 (12) |
| Al29A$^{viii}$—Ru4B—Al29A$^{ix}$ | 61.0 (2) | Si8—Al23—Si10A | 54.96 (11) |
| Al31B—Ru4B—Al27 | 85.1 (3) | Al10B—Al23—Si10A | 7.9 (4) |
| Al31B$^{vii}$—Ru4B—Al27 | 113.4 (5) | Si17$^{vii}$—Al23—Ru5A | 56.81 (5) |
| Al31C$^{vii}$—Ru4B—Al27 | 132.4 (7) | Al21—Al23—Ru5A | 108.53 (4) |
| Al31C—Ru4B—Al27 | 71.1 (4) | Ru3—Al23—Ru5A | 106.29 (5) |
| Al29B$^{viii}$—Ru4B—Al27 | 89.08 (17) | Ru6—Al23—Ru5A | 112.15 (4) |
| Al29B$^{ix}$—Ru4B—Al27 | 154.9 (4) | Si8—Al23—Ru5A | 100.65 (4) |
| Al31A—Ru4B—Al27 | 94.5 (3) | Al10B—Al23—Ru5A | 51.2 (2) |
| Al13—Ru4B—Al27 | 62.25 (17) | Si10A—Al23—Ru5A | 54.60 (8) |
| Al29A$^{viii}$—Ru4B—Al27 | 90.80 (10) | Si17$^{vii}$—Al23—Ru5B | 54.40 (11) |

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| Al29A$^{ix}$—Ru4B—Al27 | 149.4 (3) | Al21—Al23—Ru5B | 107.46 (8) |
| Al31B—Ru4B—Al27$^{vii}$ | 113.4 (5) | Ru3—Al23—Ru5B | 108.24 (11) |
| Al31B$^{vii}$—Ru4B—Al27$^{vii}$ | 85.1 (3) | Ru6—Al23—Ru5B | 110.30 (10) |
| Al31C$^{vii}$—Ru4B—Al27$^{vii}$ | 71.1 (4) | Si8—Al23—Ru5B | 101.71 (8) |
| Al31C—Ru4B—Al27$^{vii}$ | 132.4 (7) | Al10B—Al23—Ru5B | 53.8 (2) |
| Al29B$^{viii}$—Ru4B—Al27$^{vii}$ | 154.9 (4) | Si10A—Al23—Ru5B | 57.00 (12) |
| Al29B$^{ix}$—Ru4B—Al27$^{vii}$ | 89.08 (17) | Ru5A—Al23—Ru5B | 2.98 (10) |
| Al31A—Ru4B—Al27$^{vii}$ | 94.5 (3) | Si17$^{vii}$—Al23—Al24 | 80.338 (18) |
| Al13—Ru4B—Al27$^{vii}$ | 62.25 (17) | Al21—Al23—Al24 | 137.05 (2) |
| Al29A$^{viii}$—Ru4B—Al27$^{vii}$ | 149.4 (3) | Ru3—Al23—Al24 | 157.64 (2) |
| Al29A$^{ix}$—Ru4B—Al27$^{vii}$ | 90.80 (10) | Ru6—Al23—Al24 | 56.553 (13) |
| Al27—Ru4B—Al27$^{vii}$ | 113.0 (5) | Si8—Al23—Al24 | 61.690 (16) |
| Al10B—Ru5A—Al32B$^{vi}$ | 113.0 (3) | Al10B—Al23—Al24 | 67.6 (4) |
| Al10B—Ru5A—Al31C$^{vi}$ | 85.0 (6) | Si10A—Al23—Al24 | 62.38 (8) |
| Al32B$^{vi}$—Ru5A—Al31C$^{vi}$ | 36.8 (4) | Ru5A—Al23—Al24 | 56.98 (4) |
| Al10B—Ru5A—Al32B$^{x}$ | 121.0 (2) | Ru5B—Al23—Al24 | 55.77 (9) |
| Al32B$^{vi}$—Ru5A—Al32B$^{x}$ | 18.9 (2) | Si17$^{vii}$—Al23—Si19$^{vi}$ | 66.662 (17) |
| Al31C$^{vi}$—Ru5A—Al32B$^{x}$ | 55.1 (4) | Al21—Al23—Si19$^{vi}$ | 72.882 (17) |
| Al10B—Ru5A—Al31B$^{vi}$ | 66.8 (5) | Ru3—Al23—Si19$^{vi}$ | 54.261 (13) |
| Al32B$^{vi}$—Ru5A—Al31B$^{vi}$ | 54.8 (2) | Ru6—Al23—Si19$^{vi}$ | 163.70 (2) |
| Al31C$^{vi}$—Ru5A—Al31B$^{vi}$ | 19.1 (4) | Si8—Al23—Si19$^{vi}$ | 127.53 (2) |
| Al32B$^{x}$—Ru5A—Al31B$^{vi}$ | 72.1 (2) | Al10B—Al23—Si19$^{vi}$ | 67.0 (5) |
| Al10B—Ru5A—Si19$^{vi}$ | 78.5 (5) | Si10A—Al23—Si19$^{vi}$ | 74.84 (12) |
| Al32B$^{vi}$—Ru5A—Si19$^{vi}$ | 107.37 (12) | Ru5A—Al23—Si19$^{vi}$ | 53.13 (4) |
| Al31C$^{vi}$—Ru5A—Si19$^{vi}$ | 78.9 (3) | Ru5B—Al23—Si19$^{vi}$ | 54.65 (10) |
| Al32B$^{x}$—Ru5A—Si19$^{vi}$ | 124.43 (12) | Al24—Al23—Si19$^{vi}$ | 109.956 (19) |
| Al31B$^{vi}$—Ru5A—Si19$^{vi}$ | 70.77 (16) | Si18$^{vii}$—Al24—Ru6 | 108.644 (19) |
| Al10B—Ru5A—Si10A | 8.2 (5) | Si18$^{vii}$—Al24—Ru5B | 110.23 (12) |
| Al32B$^{vi}$—Ru5A—Si10A | 115.65 (14) | Ru6—Al24—Ru5B | 118.14 (8) |
| Al31C$^{vi}$—Ru5A—Si10A | 90.9 (4) | Si18$^{vii}$—Al24—Ru5A | 112.93 (6) |
| Al32B$^{x}$—Ru5A—Si10A | 120.89 (13) | Ru6—Al24—Ru5A | 117.76 (3) |
| Al31B$^{vi}$—Ru5A—Si10A | 73.3 (2) | Ru5B—Al24—Ru5A | 3.11 (10) |
| Si19$^{vi}$—Ru5A—Si10A | 85.24 (13) | Si18$^{vii}$—Al24—Al20$^{vii}$ | 59.685 (17) |
| Al10B—Ru5A—Si17$^{vii}$ | 122.7 (2) | Ru6—Al24—Al20$^{vii}$ | 59.851 (14) |
| Al32B$^{vi}$—Ru5A—Si17$^{vii}$ | 122.58 (15) | Ru5B—Al24—Al20$^{vii}$ | 104.30 (12) |
| Al31C$^{vi}$—Ru5A—Si17$^{vii}$ | 134.1 (3) | Ru5A—Al24—Al20$^{vii}$ | 106.90 (6) |
| Al32B$^{x}$—Ru5A—Si17$^{vii}$ | 116.12 (16) | Si18$^{vii}$—Al24—Al22 | 92.44 (2) |
| Al31B$^{vi}$—Ru5A—Si17$^{vii}$ | 139.43 (14) | Ru6—Al24—Al22 | 156.41 (2) |
| Si19$^{vi}$—Ru5A—Si17$^{vii}$ | 73.14 (3) | Ru5B—Al24—Al22 | 60.94 (9) |
| Si10A—Ru5A—Si17$^{vii}$ | 121.47 (7) | Ru5A—Al24—Al22 | 59.89 (3) |
| Al10B—Ru5A—Al29B$^{vii}$ | 141.5 (6) | Al20$^{vii}$—Al24—Al22 | 143.42 (2) |
| Al32B$^{vi}$—Ru5A—Al29B$^{vii}$ | 82.6 (4) | Si18$^{vii}$—Al24—Al29A$^{vii}$ | 59.24 (4) |
| Al31C$^{vi}$—Ru5A—Al29B$^{vii}$ | 119.1 (5) | Ru6—Al24—Al29A$^{vii}$ | 112.61 (10) |
| Al32B$^{x}$—Ru5A—Al29B$^{vii}$ | 65.4 (4) | Ru5B—Al24—Al29A$^{vii}$ | 56.43 (16) |
| Al31B$^{vi}$—Ru5A—Al29B$^{vii}$ | 137.3 (4) | Ru5A—Al24—Al29A$^{vii}$ | 59.53 (11) |
| Si19$^{vi}$—Ru5A—Al29B$^{vii}$ | 132.33 (18) | Al20$^{vii}$—Al24—Al29A$^{vii}$ | 59.19 (11) |
| Si10A—Ru5A—Al29B$^{vii}$ | 133.3 (2) | Al22—Al24—Al29A$^{vii}$ | 86.96 (11) |
| Si17$^{vii}$—Ru5A—Al29B$^{vii}$ | 63.1 (3) | Si18$^{vii}$—Al24—Ru7 | 58.295 (14) |

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| Al10B—Ru5A—Al25$^{v}$ | 137.7 (6) | Ru6—Al24—Ru7 | 118.408 (17) |
| Al32B$^{vi}$—Ru5A—Al25$^{v}$ | 66.26 (12) | Ru5B—Al24—Ru7 | 122.67 (8) |
| Al31C$^{vi}$—Ru5A—Al25$^{v}$ | 71.2 (3) | Ru5A—Al24—Ru7 | 122.40 (3) |
| Al32B$^{x}$—Ru5A—Al25$^{v}$ | 72.90 (12) | Al20$^{vii}$—Al24—Ru7 | 111.042 (19) |
| Al31B$^{vi}$—Ru5A—Al25$^{v}$ | 83.44 (16) | Al22—Al24—Ru7 | 63.710 (14) |
| Si19$^{vi}$—Ru5A—Al25$^{v}$ | 63.15 (3) | Al29A$^{vii}$—Al24—Ru7 | 107.81 (4) |
| Si10A—Ru5A—Al25$^{v}$ | 145.72 (16) | Si18$^{vii}$—Al24—Al26 | 90.35 (2) |
| Si17$^{vii}$—Ru5A—Al25$^{v}$ | 63.90 (5) | Ru6—Al24—Al26 | 61.627 (14) |
| Al29B$^{vii}$—Ru5A—Al25$^{v}$ | 80.65 (16) | Ru5B—Al24—Al26 | 156.80 (13) |
| Al10B—Ru5A—Al24 | 75.5 (6) | Ru5A—Al24—Al26 | 153.69 (7) |
| Al32B$^{vi}$—Ru5A—Al24 | 123.97 (13) | Al20$^{vii}$—Al24—Al26 | 95.19 (2) |
| Al31C$^{vi}$—Ru5A—Al24 | 140.8 (3) | Al22—Al24—Al26 | 109.18 (2) |
| Al32B$^{x}$—Ru5A—Al24 | 107.45 (13) | Al29A$^{vii}$—Al24—Al26 | 146.73 (8) |
| Al31B$^{vi}$—Ru5A—Al24 | 133.11 (16) | Ru7—Al24—Al26 | 58.949 (13) |
| Si19$^{vi}$—Ru5A—Al24 | 128.12 (6) | Si18$^{vii}$—Al24—Al23 | 145.37 (2) |
| Si10A—Ru5A—Al24 | 67.45 (12) | Ru6—Al24—Al23 | 58.819 (13) |
| Si17$^{vii}$—Ru5A—Al24 | 84.51 (5) | Ru5B—Al24—Al23 | 61.68 (8) |
| Al29B$^{vii}$—Ru5A—Al24 | 67.0 (2) | Ru5A—Al24—Al23 | 60.48 (4) |
| Al25$^{v}$—Ru5A—Al24 | 142.69 (11) | Al20$^{vii}$—Al24—Al23 | 88.534 (19) |
| Al10B—Ru5A—Al29A$^{vii}$ | 137.2 (6) | Al22—Al24—Al23 | 108.79 (2) |
| Al32B$^{vi}$—Ru5A—Al29A$^{vii}$ | 89.86 (18) | Al29A$^{vii}$—Al24—Al23 | 93.98 (3) |
| Al31C$^{vi}$—Ru5A—Al29A$^{vii}$ | 126.4 (4) | Ru7—Al24—Al23 | 155.98 (2) |
| Al32B$^{x}$—Ru5A—Al29A$^{vii}$ | 72.55 (17) | Al26—Al24—Al23 | 107.13 (2) |
| Al31B$^{vi}$—Ru5A—Al29A$^{vii}$ | 144.5 (2) | Si18$^{vii}$—Al24—Si8 | 146.78 (2) |
| Si19$^{vi}$—Ru5A—Al29A$^{vii}$ | 130.35 (8) | Ru6—Al24—Si8 | 56.304 (14) |
| Si10A—Ru5A—Al29A$^{vii}$ | 129.07 (15) | Ru5B—Al24—Si8 | 102.75 (12) |
| Si17$^{vii}$—Ru5A—Al29A$^{vii}$ | 58.77 (8) | Ru5A—Al24—Si8 | 99.93 (6) |
| Al29B$^{vii}$—Ru5A—Al29A$^{vii}$ | 7.3 (2) | Al20$^{vii}$—Al24—Si8 | 116.11 (2) |
| Al25$^{v}$—Ru5A—Al29A$^{vii}$ | 84.03 (10) | Al22—Al24—Si8 | 100.20 (2) |
| Al24—Ru5A—Al29A$^{vii}$ | 61.83 (10) | Al29A$^{vii}$—Al24—Si8 | 151.16 (3) |
| Al32B$^{vi}$—Ru5B—Al32B$^{x}$ | 19.2 (2) | Ru7—Al24—Si8 | 100.331 (19) |
| Al32B$^{vi}$—Ru5B—Al29B$^{vii}$ | 85.9 (4) | Al26—Al24—Si8 | 56.507 (18) |
| Al32B$^{x}$—Ru5B—Al29B$^{vii}$ | 68.5 (4) | Al23—Al24—Si8 | 57.219 (18) |
| Al32B$^{vi}$—Ru5B—Si17$^{vii}$ | 126.7 (2) | Si9A$^{ix}$—Al25—Ru5B$^{xvi}$ | 128.55 (13) |
| Al32B$^{x}$—Ru5B—Si17$^{vii}$ | 121.3 (3) | Si9A$^{ix}$—Al25—Si9B$^{ix}$ | 21.90 (6) |
| Al29B$^{vii}$—Ru5B—Si17$^{vii}$ | 66.4 (3) | Ru5B$^{xvi}$—Al25—Si9B$^{ix}$ | 106.70 (14) |
| Al32B$^{vi}$—Ru5B—Al31C$^{vi}$ | 36.2 (4) | Si9A$^{ix}$—Al25—Ru6$^{vii}$ | 114.15 (3) |
| Al32B$^{x}$—Ru5B—Al31C$^{vi}$ | 54.7 (4) | Ru5B$^{xvi}$—Al25—Ru6$^{vii}$ | 115.92 (12) |
| Al29B$^{vii}$—Ru5B—Al31C$^{vi}$ | 121.9 (5) | Si9B$^{ix}$—Al25—Ru6$^{vii}$ | 135.61 (6) |
| Si17$^{vii}$—Ru5B—Al31C$^{vi}$ | 134.6 (3) | Si9A$^{ix}$—Al25—Ru5A$^{xvi}$ | 131.44 (7) |
| Al32B$^{vi}$—Ru5B—Al10B | 108.8 (4) | Ru5B$^{xvi}$—Al25—Ru5A$^{xvi}$ | 3.09 (11) |
| Al32B$^{x}$—Ru5B—Al10B | 117.8 (3) | Si9B$^{ix}$—Al25—Ru5A$^{xvi}$ | 109.56 (8) |
| Al29B$^{vii}$—Ru5B—Al10B | 142.6 (6) | Ru6$^{vii}$—Al25—Ru5A$^{xvi}$ | 113.37 (6) |
| Si17$^{vii}$—Ru5B—Al10B | 120.9 (2) | Si9A$^{ix}$—Al25—Al32A$^{vii}$ | 110.33 (3) |
| Al31C$^{vi}$—Ru5B—Al10B | 80.8 (6) | Ru5B$^{xvi}$—Al25—Al32A$^{vii}$ | 61.68 (10) |
| Al32B$^{vi}$—Ru5B—Al29A$^{vii}$ | 93.6 (2) | Si9B$^{ix}$—Al25—Al32A$^{vii}$ | 100.19 (5) |
| Al32B$^{x}$—Ru5B—Al29A$^{vii}$ | 76.0 (2) | Ru6$^{vii}$—Al25—Al32A$^{vii}$ | 110.16 (3) |
| Al29B$^{vii}$—Ru5B—Al29A$^{vii}$ | 7.7 (2) | Ru5A$^{xvi}$—Al25—Al32A$^{vii}$ | 60.43 (4) |

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| Si17$^{vii}$—Ru5B—Al29A$^{vii}$ | 61.77 (15) |
| Al31C$^{vi}$—Ru5B—Al29A$^{vii}$ | 129.6 (4) |
| Al10B—Ru5B—Al29A$^{vii}$ | 138.2 (6) |
| Al32B$^{vi}$—Ru5B—Si19$^{vi}$ | 105.1 (2) |
| Al32B$^{x}$—Ru5B—Si19$^{vi}$ | 123.0 (2) |
| Al29B$^{vii}$—Ru5B—Si19$^{vi}$ | 135.8 (3) |
| Si17$^{vii}$—Ru5B—Si19$^{vi}$ | 73.17 (10) |
| Al31C$^{vi}$—Ru5B—Si19$^{vi}$ | 76.0 (3) |
| Al10B—Ru5B—Si19$^{vi}$ | 74.8 (5) |
| Al29A$^{vii}$—Ru5B—Si19$^{vi}$ | 133.56 (19) |
| Al32B$^{vi}$—Ru5B—Al25$^{v}$ | 67.10 (14) |
| Al32B$^{x}$—Ru5B—Al25$^{v}$ | 74.45 (15) |
| Al29B$^{vii}$—Ru5B—Al25$^{v}$ | 84.3 (2) |
| Si17$^{vii}$—Ru5B—Al25$^{v}$ | 65.67 (11) |
| Al31C$^{vi}$—Ru5B—Al25$^{v}$ | 70.8 (3) |
| Al10B—Ru5B—Al25$^{v}$ | 133.0 (6) |
| Al29A$^{vii}$—Ru5B—Al25$^{v}$ | 87.84 (18) |
| Si19$^{vi}$—Ru5B—Al25$^{v}$ | 62.70 (9) |
| Al32B$^{vi}$—Ru5B—Al31B$^{vi}$ | 53.4 (2) |
| Al32B$^{x}$—Ru5B—Al31B$^{vi}$ | 70.9 (2) |
| Al29B$^{vii}$—Ru5B—Al31B$^{vi}$ | 139.2 (4) |
| Si17$^{vii}$—Ru5B—Al31B$^{vi}$ | 137.7 (2) |
| Al31C$^{vi}$—Ru5B—Al31B$^{vi}$ | 18.3 (3) |
| Al10B—Ru5B—Al31B$^{vi}$ | 63.3 (5) |
| Al29A$^{vii}$—Ru5B—Al31B$^{vi}$ | 146.8 (3) |
| Si19$^{vi}$—Ru5B—Al31B$^{vi}$ | 67.8 (2) |
| Al25$^{v}$—Ru5B—Al31B$^{vi}$ | 82.13 (19) |
| Al32B$^{vi}$—Ru5B—Al24 | 126.01 (19) |
| Al32B$^{x}$—Ru5B—Al24 | 110.14 (19) |
| Al29B$^{vii}$—Ru5B—Al24 | 69.6 (3) |
| Si17$^{vii}$—Ru5B—Al24 | 86.99 (15) |
| Al31C$^{vi}$—Ru5B—Al24 | 138.4 (3) |
| Al10B—Ru5B—Al24 | 74.1 (6) |
| Al29A$^{vii}$—Ru5B—Al24 | 64.23 (16) |
| Si19$^{vi}$—Ru5B—Al24 | 126.23 (15) |
| Al25$^{v}$—Ru5B—Al24 | 148.3 (3) |
| Al31B$^{vi}$—Ru5B—Al24 | 129.4 (2) |
| Al32B$^{vi}$—Ru5B—Si10A | 111.8 (2) |
| Al32B$^{x}$—Ru5B—Si10A | 118.1 (2) |
| Al29B$^{vii}$—Ru5B—Si10A | 134.7 (3) |
| Si17$^{vii}$—Ru5B—Si10A | 120.13 (14) |
| Al31C$^{vi}$—Ru5B—Si10A | 86.6 (4) |
| Al10B—Ru5B—Si10A | 7.9 (4) |
| Al29A$^{vii}$—Ru5B—Si10A | 130.4 (2) |
| Si19$^{vi}$—Ru5B—Si10A | 81.33 (19) |
| Al25$^{v}$—Ru5B—Si10A | 140.8 (3) |
| Al31B$^{vi}$—Ru5B—Si10A | 69.6 (2) |
| Al24—Ru5B—Si10A | 66.34 (15) |
| Si9A$^{ix}$—Al25—Si19$^{vii}$ | 164.51 (3) |
| Ru5B$^{xvi}$—Al25—Si19$^{vii}$ | 58.62 (11) |
| Si9B$^{ix}$—Al25—Si19$^{vii}$ | 159.82 (6) |
| Ru6$^{vii}$—Al25—Si19$^{vii}$ | 57.349 (14) |
| Ru5A$^{xvi}$—Al25—Si19$^{vii}$ | 56.18 (5) |
| Al32A$^{vii}$—Al25—Si19$^{vii}$ | 85.14 (2) |
| Si9A$^{ix}$—Al25—Al27$^{vii}$ | 99.80 (3) |
| Ru5B$^{xvi}$—Al25—Al27$^{vii}$ | 112.82 (13) |
| Si9B$^{ix}$—Al25—Al27$^{vii}$ | 111.92 (5) |
| Ru6$^{vii}$—Al25—Al27$^{vii}$ | 62.571 (15) |
| Ru5A$^{xvi}$—Al25—Al27$^{vii}$ | 110.28 (5) |
| Al32A$^{vii}$—Al25—Al27$^{vii}$ | 59.01 (2) |
| Si19$^{vii}$—Al25—Al27$^{vii}$ | 87.59 (2) |
| Si9A$^{ix}$—Al25—Si17$^{xv}$ | 104.45 (3) |
| Ru5B$^{xvi}$—Al25—Si17$^{xv}$ | 55.05 (10) |
| Si9B$^{ix}$—Al25—Si17$^{xv}$ | 93.09 (5) |
| Ru6$^{vii}$—Al25—Si17$^{xv}$ | 100.998 (18) |
| Ru5A$^{xvi}$—Al25—Si17$^{xv}$ | 56.63 (4) |
| Al32A$^{vii}$—Al25—Si17$^{xv}$ | 116.53 (3) |
| Si19$^{vii}$—Al25—Si17$^{xv}$ | 67.345 (17) |
| Al27$^{vii}$—Al25—Si17$^{xv}$ | 154.93 (2) |
| Si9A$^{ix}$—Al25—Al32B$^{vii}$ | 102.03 (10) |
| Ru5B$^{xvi}$—Al25—Al32B$^{vii}$ | 52.82 (12) |
| Si9B$^{ix}$—Al25—Al32B$^{vii}$ | 87.00 (11) |
| Ru6$^{vii}$—Al25—Al32B$^{vii}$ | 128.48 (10) |
| Ru5A$^{xvi}$—Al25—Al32B$^{vii}$ | 52.63 (10) |
| Al32A$^{vii}$—Al25—Al32B$^{vii}$ | 18.95 (9) |
| Si19$^{vii}$—Al25—Al32B$^{vii}$ | 92.89 (10) |
| Al27$^{vii}$—Al25—Al32B$^{vii}$ | 76.56 (10) |
| Si17$^{xv}$—Al25—Al32B$^{vii}$ | 104.12 (10) |
| Si9A$^{ix}$—Al25—Si16 | 97.04 (3) |
| Ru5B$^{xvi}$—Al25—Si16 | 101.30 (8) |
| Si9B$^{ix}$—Al25—Si16 | 105.52 (5) |
| Ru6$^{vii}$—Al25—Si16 | 55.609 (13) |
| Ru5A$^{xvi}$—Al25—Si16 | 101.37 (3) |
| Al32A$^{vii}$—Al25—Si16 | 152.62 (3) |
| Si19$^{vii}$—Al25—Si16 | 67.479 (16) |
| Al27$^{vii}$—Al25—Si16 | 117.52 (2) |
| Si17$^{xv}$—Al25—Si16 | 53.440 (15) |
| Al32B$^{vii}$—Al25—Si16 | 153.98 (10) |
| Si9A$^{ix}$—Al25—Al22$^{xxi}$ | 55.52 (2) |
| Ru5B$^{xvi}$—Al25—Al22$^{xxi}$ | 110.56 (8) |
| Si9B$^{ix}$—Al25—Al22$^{xxi}$ | 56.81 (5) |
| Ru6$^{vii}$—Al25—Al22$^{xxi}$ | 114.61 (2) |
| Ru5A$^{xvi}$—Al25—Al22$^{xxi}$ | 110.96 (3) |
| Al32A$^{vii}$—Al25—Al22$^{xxi}$ | 58.16 (2) |
| Si19$^{vii}$—Al25—Al22$^{xxi}$ | 138.51 (2) |
| Al27$^{vii}$—Al25—Al22$^{xxi}$ | 58.274 (17) |

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| Si16$^{vii}$—Ru6—Si19 | 73.752 (14) | Si17$^{xv}$—Al25—Al22$^{xxi}$ | 143.73 (2) |
| Si16$^{vii}$—Ru6—Si8 | 119.473 (16) | Al32B$^{vii}$—Al25—Al22$^{xxi}$ | 58.96 (10) |
| Si19—Ru6—Si8 | 84.882 (16) | Si16—Al25—Al22$^{xxi}$ | 146.74 (2) |
| Si16$^{vii}$—Ru6—Al24 | 85.523 (14) | Ru3$^{xv}$—Al26—Si16$^{vii}$ | 102.244 (18) |
| Si19—Ru6—Al24 | 129.919 (14) | Ru3$^{xv}$—Al26—Al21$^{xv}$ | 58.455 (14) |
| Si8—Ru6—Al24 | 66.403 (16) | Si16$^{vii}$—Al26—Al21$^{xv}$ | 59.966 (17) |
| Si16$^{vii}$—Ru6—Al25$^{vii}$ | 65.368 (14) | Ru3$^{xv}$—Al26—Si8 | 95.784 (19) |
| Si19—Ru6—Al25$^{vii}$ | 63.124 (14) | Si16$^{vii}$—Al26—Si8 | 111.61 (2) |
| Si8—Ru6—Al25$^{vii}$ | 145.654 (17) | Al21$^{xv}$—Al26—Si8 | 146.06 (2) |
| Al24—Ru6—Al25$^{vii}$ | 144.281 (16) | Ru3$^{xv}$—Al26—Ru7 | 141.451 (19) |
| Si16$^{vii}$—Ru6—Al20$^{vii}$ | 59.439 (14) | Si16$^{vii}$—Al26—Ru7 | 99.520 (18) |
| Si19—Ru6—Al20$^{vii}$ | 131.436 (15) | Al21$^{xv}$—Al26—Ru7 | 108.583 (19) |
| Si8—Ru6—Al20$^{vii}$ | 128.011 (16) | Si8—Al26—Ru7 | 105.23 (2) |
| Al24—Ru6—Al20$^{vii}$ | 61.662 (15) | Ru3$^{xv}$—Al26—Al11 | 113.311 (19) |
| Al25$^{vii}$—Ru6—Al20$^{vii}$ | 84.991 (15) | Si16$^{vii}$—Al26—Al11 | 144.17 (2) |
| Si16$^{vii}$—Ru6—Al23 | 147.194 (14) | Al21$^{xv}$—Al26—Al11 | 145.26 (2) |
| Si19—Ru6—Al23 | 135.764 (15) | Si8—Al26—Al11 | 61.90 (2) |
| Si8—Ru6—Al23 | 62.146 (17) | Ru7—Al26—Al11 | 54.412 (12) |
| Al24—Ru6—Al23 | 64.628 (14) | Ru3$^{xv}$—Al26—Ru6 | 105.140 (16) |
| Al25$^{vii}$—Ru6—Al23 | 134.258 (15) | Si16$^{vii}$—Al26—Ru6 | 55.329 (13) |
| Al20$^{vii}$—Ru6—Al23 | 92.788 (15) | Al21$^{xv}$—Al26—Ru6 | 106.047 (19) |
| Si16$^{vii}$—Ru6—Al13 | 133.510 (18) | Si8—Al26—Ru6 | 56.299 (13) |
| Si19—Ru6—Al13 | 59.769 (18) | Ru7—Al26—Ru6 | 113.409 (17) |
| Si8—Ru6—Al13 | 58.452 (17) | Al11—Al26—Ru6 | 108.61 (2) |
| Al24—Ru6—Al13 | 122.930 (17) | Ru3$^{xv}$—Al26—Al24 | 155.88 (2) |
| Al25$^{vii}$—Ru6—Al13 | 92.680 (17) | Si16$^{vii}$—Al26—Al24 | 79.141 (18) |
| Al20$^{vii}$—Ru6—Al13 | 163.833 (17) | Al21$^{xv}$—Al26—Al24 | 135.83 (2) |
| Al23—Ru6—Al13 | 77.385 (18) | Si8—Al26—Al24 | 62.192 (16) |
| Si16$^{vii}$—Ru6—Al26 | 59.727 (14) | Ru7—Al26—Al24 | 59.871 (13) |
| Si19—Ru6—Al26 | 67.301 (13) | Al11—Al26—Al24 | 66.696 (18) |
| Si8—Ru6—Al26 | 59.762 (16) | Ru6—Al26—Al24 | 55.497 (13) |
| Al24—Ru6—Al26 | 62.875 (14) | Ru3$^{xv}$—Al26—Al26$^{vii}$ | 56.970 (11) |
| Al25$^{vii}$—Ru6—Al26 | 113.153 (15) | Si16$^{vii}$—Al26—Al26$^{vii}$ | 151.308 (13) |
| Al20$^{vii}$—Ru6—Al26 | 97.033 (15) | Al21$^{xv}$—Al26—Al26$^{vii}$ | 112.414 (15) |
| Al23—Ru6—Al26 | 112.461 (14) | Si8—Al26—Al26$^{vii}$ | 57.481 (12) |
| Al13—Ru6—Al26 | 98.582 (17) | Ru7—Al26—Al26$^{vii}$ | 108.889 (11) |
| Si16$^{vii}$—Ru6—Al27 | 125.610 (15) | Al11—Al26—Al26$^{vii}$ | 58.656 (12) |
| Si19—Ru6—Al27 | 89.805 (15) | Ru6—Al26—Al26$^{vii}$ | 107.552 (10) |
| Si8—Ru6—Al27 | 109.764 (16) | Al24—Al26—Al26$^{vii}$ | 111.536 (14) |
| Al24—Ru6—Al27 | 137.383 (16) | Ru4A—Al27—Al30A$^{vii}$ | 166.95 (10) |
| Al25$^{vii}$—Ru6—Al27 | 61.026 (15) | Ru4A—Al27—Ru4B | 5.8 (4) |
| Al20$^{vii}$—Ru6—Al27 | 106.387 (15) | Al30A$^{vii}$—Al27—Ru4B | 172.7 (5) |
| Al23—Ru6—Al27 | 76.151 (15) | Ru4A—Al27—Al32A | 65.45 (6) |
| Al13—Ru6—Al27 | 59.067 (16) | Al30A$^{vii}$—Al27—Al32A | 126.77 (9) |
| Al26—Ru6—Al27 | 154.792 (15) | Ru4B—Al27—Al32A | 60.3 (4) |
| Si16$^{vii}$—Ru6—Al30A$^{vii}$ | 102.70 (7) | Ru4A—Al27—Al13 | 57.67 (2) |
| Si19—Ru6—Al30A$^{vii}$ | 132.20 (5) | Al30A$^{vii}$—Al27—Al13 | 122.47 (7) |
| Si8—Ru6—Al30A$^{vii}$ | 131.46 (8) | Ru4B—Al27—Al13 | 56.81 (15) |

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| Al24—Ru6—Al30A$^{vii}$ | 96.30 (4) | Al32A—Al27—Al13 | 88.32 (3) |
| Al25$^{vii}$—Ru6—Al30A$^{vii}$ | 72.10 (7) | Ru4A—Al27—Al22$^{xx}$ | 113.48 (4) |
| Al20$^{vii}$—Ru6—Al30A$^{vii}$ | 55.35 (3) | Al30A$^{vii}$—Al27—Al22$^{xx}$ | 74.19 (9) |
| Al23—Ru6—Al30A$^{vii}$ | 69.43 (8) | Ru4B—Al27—Al22$^{xx}$ | 110.7 (3) |
| Al13—Ru6—Al30A$^{vii}$ | 108.73 (4) | Al32A—Al27—Al22$^{xx}$ | 59.81 (2) |
| Al26—Ru6—Al30A$^{vii}$ | 152.08 (3) | Al13—Al27—Al22$^{xx}$ | 144.86 (3) |
| Al27—Ru6—Al30A$^{vii}$ | 52.71 (2) | Ru4A—Al27—Ru7$^{xx}$ | 112.40 (5) |
| Al21$^{x}$—Ru7—Al11 | 141.649 (18) | Al30A$^{vii}$—Al27—Ru7$^{xx}$ | 60.33 (2) |
| Al21$^{x}$—Ru7—Si18$^{vii}$ | 91.431 (15) | Ru4B—Al27—Ru7$^{xx}$ | 116.2 (3) |
| Al11—Ru7—Si18$^{vii}$ | 126.820 (18) | Al32A—Al27—Ru7$^{xx}$ | 113.89 (2) |
| Al21$^{x}$—Ru7—Al30A$^{i}$ | 65.17 (9) | Al13—Al27—Ru7$^{xx}$ | 150.38 (3) |
| Al11—Ru7—Al30A$^{i}$ | 89.79 (9) | Al22$^{xx}$—Al27—Ru7$^{xx}$ | 64.048 (15) |
| Si18$^{vii}$—Ru7—Al30A$^{i}$ | 119.80 (5) | Ru4A—Al27—Al25$^{vii}$ | 115.47 (7) |
| Al21$^{x}$—Ru7—Al27$^{x}$ | 74.643 (15) | Al30A$^{vii}$—Al27—Al25$^{vii}$ | 77.24 (6) |
| Al11—Ru7—Al27$^{x}$ | 116.895 (19) | Ru4B—Al27—Al25$^{vii}$ | 109.8 (5) |
| Si18$^{vii}$—Ru7—Al27$^{x}$ | 63.540 (14) | Al32A—Al27—Al25$^{vii}$ | 59.34 (2) |
| Al30A$^{i}$—Ru7—Al27$^{x}$ | 57.08 (4) | Al13—Al27—Al25$^{vii}$ | 89.33 (2) |
| Al21$^{x}$—Ru7—Al30B$^{i}$ | 75.60 (15) | Al22$^{xx}$—Al27—Al25$^{vii}$ | 62.742 (18) |
| Al11—Ru7—Al30B$^{i}$ | 79.40 (15) | Ru7$^{xx}$—Al27—Al25$^{vii}$ | 118.42 (2) |
| Si18$^{vii}$—Ru7—Al30B$^{i}$ | 124.40 (8) | Ru4A—Al27—Al30B$^{vii}$ | 172.03 (8) |
| Al30A$^{i}$—Ru7—Al30B$^{i}$ | 10.77 (8) | Al30A$^{vii}$—Al27—Al30B$^{vii}$ | 10.21 (7) |
| Al27$^{x}$—Ru7—Al30B$^{i}$ | 60.87 (9) | Ru4B—Al27—Al30B$^{vii}$ | 174.26 (18) |
| Al21$^{x}$—Ru7—Al26 | 126.897 (15) | Al32A—Al27—Al30B$^{vii}$ | 116.91 (14) |
| Al11—Ru7—Al26 | 63.063 (18) | Al13—Al27—Al30B$^{vii}$ | 128.85 (10) |
| Si18$^{vii}$—Ru7—Al26 | 90.562 (14) | Al22$^{xx}$—Al27—Al30B$^{vii}$ | 64.32 (14) |
| Al30A$^{i}$—Ru7—Al26 | 148.47 (7) | Ru7$^{xx}$—Al27—Al30B$^{vii}$ | 59.63 (7) |
| Al27$^{x}$—Ru7—Al26 | 148.316 (15) | Al25$^{vii}$—Al27—Al30B$^{vii}$ | 70.90 (10) |
| Al30B$^{i}$—Ru7—Al26 | 140.15 (13) | Ru4A—Al27—Ru6 | 115.40 (3) |
| Al21$^{x}$—Ru7—Al28$^{xi}$ | 64.563 (16) | Al30A$^{vii}$—Al27—Ru6 | 68.21 (4) |
| Al11—Ru7—Al28$^{xi}$ | 95.882 (19) | Ru4B—Al27—Ru6 | 113.4 (2) |
| Si18$^{vii}$—Ru7—Al28$^{xi}$ | 116.253 (15) | Al32A—Al27—Ru6 | 105.41 (2) |
| Al30A$^{i}$—Ru7—Al28$^{xi}$ | 102.54 (4) | Al13—Al27—Ru6 | 58.283 (15) |
| Al27$^{x}$—Ru7—Al28$^{xi}$ | 139.202 (16) | Al22$^{xx}$—Al27—Ru6 | 113.12 (2) |
| Al30B$^{i}$—Ru7—Al28$^{xi}$ | 106.22 (9) | Ru7$^{xx}$—Al27—Ru6 | 127.19 (2) |
| Al26—Ru7—Al28$^{xi}$ | 67.242 (15) | Al25$^{vii}$—Al27—Ru6 | 56.403 (14) |
| Al21$^{x}$—Ru7—Al24 | 147.730 (15) | Al30B$^{vii}$—Al27—Ru6 | 71.86 (8) |
| Al11—Ru7—Al24 | 70.529 (17) | Ru4A—Al27—Si18$^{viii}$ | 56.67 (4) |
| Si18$^{vii}$—Ru7—Al24 | 56.314 (14) | Al30A$^{vii}$—Al27—Si18$^{viii}$ | 115.33 (3) |
| Al30A$^{i}$—Ru7—Al24 | 127.09 (6) | Ru4B—Al27—Si18$^{viii}$ | 60.5 (3) |
| Al27$^{x}$—Ru7—Al24 | 88.245 (15) | Al32A—Al27—Si18$^{viii}$ | 88.48 (2) |
| Al30B$^{i}$—Ru7—Al24 | 119.75 (13) | Al13—Al27—Si18$^{viii}$ | 108.54 (2) |
| Al26—Ru7—Al24 | 61.180 (14) | Al22$^{xx}$—Al27—Si18$^{viii}$ | 86.554 (19) |
| Al28$^{xi}$—Ru7—Al24 | 127.289 (15) | Ru7$^{xx}$—Al27—Si18$^{viii}$ | 55.752 (13) |
| Al21$^{x}$—Ru7—Al28$^{vii}$ | 66.535 (15) | Al25$^{vii}$—Al27—Si18$^{viii}$ | 143.16 (2) |
| Al11—Ru7—Al28$^{vii}$ | 131.540 (19) | Al30B$^{vii}$—Al27—Si18$^{viii}$ | 115.37 (7) |
| Si18$^{vii}$—Ru7—Al28$^{vii}$ | 59.617 (14) | Ru6—Al27—Si18$^{viii}$ | 159.70 (2) |
| Al30A$^{i}$—Ru7—Al28$^{vii}$ | 131.67 (9) | Ru4A—Al27—Al15 | 54.37 (6) |
| Al27$^{x}$—Ru7—Al28$^{vii}$ | 107.887 (16) | Al30A$^{vii}$—Al27—Al15 | 112.87 (9) |

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| Al30B$^{i}$—Ru7—Al28$^{vii}$ | 142.13 (15) | Ru4B—Al27—Al15 | 59.8 (4) |
| Al26—Ru7—Al28$^{vii}$ | 69.242 (15) | Al32A—Al27—Al15 | 119.51 (3) |
| Al28$^{xi}$—Ru7—Al28$^{vii}$ | 56.639 (19) | Al13—Al27—Al15 | 65.91 (2) |
| Al24—Ru7—Al28$^{vii}$ | 94.190 (14) | Al22$^{xx}$—Al27—Al15 | 140.86 (3) |
| Al21$^{x}$—Ru7—Al22 | 127.209 (14) | Ru7$^{xx}$—Al27—Al15 | 85.55 (2) |
| Al11—Ru7—Al22 | 60.831 (18) | Al25$^{vii}$—Al27—Al15 | 155.08 (3) |
| Si18$^{vii}$—Ru7—Al22 | 87.294 (15) | Al30B$^{vii}$—Al27—Al15 | 121.91 (13) |
| Al30A$^{i}$—Ru7—Al22 | 70.12 (7) | Ru6—Al27—Al15 | 104.73 (2) |
| Al27$^{x}$—Ru7—Al22 | 57.854 (15) | Si18$^{viii}$—Al27—Al15 | 55.05 (2) |
| Al30B$^{i}$—Ru7—Al22 | 62.53 (12) | Ru2$^{ix}$—Al28—Al28$^{xiv}$ | 165.46 (3) |
| Al26—Ru7—Al22 | 105.892 (14) | Ru2$^{ix}$—Al28—Si16 | 57.410 (14) |
| Al28$^{xi}$—Ru7—Al22 | 154.796 (16) | Al28$^{xiv}$—Al28—Si16 | 109.86 (3) |
| Al24—Ru7—Al22 | 57.266 (13) | Ru2$^{ix}$—Al28—Si18 | 57.930 (14) |
| Al28$^{vii}$—Ru7—Al22 | 145.875 (15) | Al28$^{xiv}$—Al28—Si18 | 114.58 (3) |
| Si10A—Si8—Al13 | 134.29 (9) | Si16—Al28—Si18 | 75.902 (18) |
| Si10A—Si8—Ru6 | 112.83 (3) | Ru2$^{ix}$—Al28—Ru7$^{xxii}$ | 123.54 (2) |
| Al13—Si8—Ru6 | 62.754 (12) | Al28$^{xiv}$—Al28—Ru7$^{xxii}$ | 63.76 (2) |
| Si10A—Si8—Ru6$^{vii}$ | 112.83 (3) | Si16—Al28—Ru7$^{xxii}$ | 104.017 (19) |
| Al13—Si8—Ru6$^{vii}$ | 62.754 (12) | Si18—Al28—Ru7$^{xxii}$ | 178.26 (2) |
| Ru6—Si8—Ru6$^{vii}$ | 124.23 (2) | Ru2$^{ix}$—Al28—Al14$^{xiv}$ | 59.956 (18) |
| Si10A—Si8—Al26$^{vii}$ | 113.89 (8) | Al28$^{xiv}$—Al28—Al14$^{xiv}$ | 127.43 (3) |
| Al13—Si8—Al26$^{vii}$ | 104.28 (2) | Si16—Al28—Al14$^{xiv}$ | 77.13 (2) |
| Ru6—Si8—Al26$^{vii}$ | 120.73 (2) | Si18—Al28—Al14$^{xiv}$ | 117.52 (2) |
| Ru6$^{vii}$—Si8—Al26$^{vii}$ | 63.940 (13) | Ru7$^{xxii}$—Al28—Al14$^{xiv}$ | 64.053 (17) |
| Si10A—Si8—Al26 | 113.90 (8) | Ru2$^{ix}$—Al28—Al21$^{xvi}$ | 107.85 (2) |
| Al13—Si8—Al26 | 104.28 (2) | Al28$^{xiv}$—Al28—Al21$^{xvi}$ | 65.21 (2) |
| Ru6—Si8—Al26 | 63.940 (13) | Si16—Al28—Al21$^{xvi}$ | 57.251 (16) |
| Ru6$^{vii}$—Si8—Al26 | 120.73 (2) | Si18—Al28—Al21$^{xvi}$ | 125.93 (2) |
| Al26$^{vii}$—Si8—Al26 | 65.04 (2) | Ru7$^{xxii}$—Al28—Al21$^{xvi}$ | 53.162 (13) |
| Si10A—Si8—Al23$^{vii}$ | 63.42 (7) | Al14$^{xiv}$—Al28—Al21$^{xvi}$ | 79.051 (19) |
| Al13—Si8—Al23$^{vii}$ | 78.61 (2) | Ru2$^{ix}$—Al28—Ru7$^{vii}$ | 111.722 (19) |
| Ru6—Si8—Al23$^{vii}$ | 117.74 (2) | Al28$^{xiv}$—Al28—Ru7$^{vii}$ | 59.60 (2) |
| Ru6$^{vii}$—Si8—Al23$^{vii}$ | 60.654 (13) | Si16—Al28—Ru7$^{vii}$ | 94.790 (19) |
| Al26$^{vii}$—Si8—Al23$^{vii}$ | 114.682 (15) | Si18—Al28—Ru7$^{vii}$ | 54.988 (14) |
| Al26—Si8—Al23$^{vii}$ | 177.11 (3) | Ru7$^{xxii}$—Al28—Ru7$^{vii}$ | 123.361 (19) |
| Si10A—Si8—Al23 | 63.42 (7) | Al14$^{xiv}$—Al28—Ru7$^{vii}$ | 170.62 (2) |
| Al13—Si8—Al23 | 78.61 (2) | Al21$^{xvi}$—Al28—Ru7$^{vii}$ | 100.73 (2) |
| Ru6—Si8—Al23 | 60.653 (13) | Ru2$^{ix}$—Al28—Al21$^{xvii}$ | 125.63 (2) |
| Ru6$^{vii}$—Si8—Al23 | 117.74 (2) | Al28$^{xiv}$—Al28—Al21$^{xvii}$ | 59.73 (2) |
| Al26$^{vii}$—Si8—Al23 | 177.11 (3) | Si16—Al28—Al21$^{xvii}$ | 145.22 (2) |
| Al26—Si8—Al23 | 114.681 (15) | Si18—Al28—Al21$^{xvii}$ | 79.480 (18) |
| Al23$^{vii}$—Si8—Al23 | 65.44 (2) | Ru7$^{xxii}$—Al28—Al21$^{xvii}$ | 99.854 (18) |
| Si10A—Si8—Al11 | 64.29 (9) | Al14$^{xiv}$—Al28—Al21$^{xvii}$ | 136.84 (3) |
| Al13—Si8—Al11 | 161.43 (3) | Al21$^{xvi}$—Al28—Al21$^{xvii}$ | 124.94 (2) |
| Ru6—Si8—Al11 | 113.799 (13) | Ru7$^{vii}$—Al28—Al21$^{xvii}$ | 50.654 (12) |
| Ru6$^{vii}$—Si8—Al11 | 113.799 (13) | Ru5B$^{vii}$—Al29A—Ru4B$^{ii}$ | 124.8 (3) |
| Al26$^{vii}$—Si8—Al11 | 60.621 (19) | Ru5B$^{vii}$—Al29A—Si17 | 58.02 (9) |
| Al26—Si8—Al11 | 60.621 (19) | Ru4B$^{ii}$—Al29A—Si17 | 164.2 (5) |

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| Al23$^{vii}$—Si8—Al11 | 116.60 (2) | Ru5B$^{vii}$—Al29A—Al32A$^{xvii}$ | 63.08 (13) |
| Al23—Si8—Al11 | 116.60 (2) | Ru4B$^{ii}$—Al29A—Al32A$^{xvii}$ | 62.9 (3) |
| Si10A—Si8—Al10B | 4.9 (2) | Si17—Al29A—Al32A$^{xvii}$ | 113.93 (14) |
| Al13—Si8—Al10B | 129.4 (3) | Ru5B$^{vii}$—Al29A—Al29A$^{xviii}$ | 155.59 (12) |
| Ru6—Si8—Al10B | 111.37 (10) | Ru4B$^{ii}$—Al29A—Al29A$^{xviii}$ | 59.50 (11) |
| Ru6$^{vii}$—Si8—Al10B | 111.37 (10) | Si17—Al29A—Al29A$^{xviii}$ | 110.99 (3) |
| Al26$^{vii}$—Si8—Al10B | 117.8 (2) | Al32A$^{xvii}$—Al29A—Al29A$^{xviii}$ | 110.11 (4) |
| Al26—Si8—Al10B | 117.8 (2) | Ru5B$^{vii}$—Al29A—Ru1$^{ix}$ | 114.81 (10) |
| Al23$^{vii}$—Si8—Al10B | 59.6 (2) | Ru4B$^{ii}$—Al29A—Ru1$^{ix}$ | 118.55 (12) |
| Al23—Si8—Al10B | 59.6 (2) | Si17—Al29A—Ru1$^{ix}$ | 56.86 (6) |
| Al11—Si8—Al10B | 69.2 (3) | Al32A$^{xvii}$—Al29A—Ru1$^{ix}$ | 154.35 (16) |
| Si10A—Si8—Al24$^{vii}$ | 64.91 (3) | Al29A$^{xviii}$—Al29A—Ru1$^{ix}$ | 60.23 (4) |
| Al13—Si8—Al24$^{vii}$ | 118.294 (14) | Ru5B$^{vii}$—Al29A—Si18 | 110.29 (9) |
| Ru6—Si8—Al24$^{vii}$ | 177.69 (3) | Ru4B$^{ii}$—Al29A—Si18 | 64.4 (5) |
| Ru6$^{vii}$—Si8—Al24$^{vii}$ | 57.293 (10) | Si17—Al29A—Si18 | 130.88 (19) |
| Al26$^{vii}$—Si8—Al24$^{vii}$ | 61.302 (15) | Al32A$^{xvii}$—Al29A—Si18 | 94.94 (7) |
| Al26—Si8—Al24$^{vii}$ | 117.14 (2) | Al29A$^{xviii}$—Al29A—Si18 | 93.31 (3) |
| Al23$^{vii}$—Si8—Al24$^{vii}$ | 61.091 (15) | Ru1$^{ix}$—Al29A—Si18 | 108.8 (2) |
| Al23—Si8—Al24$^{vii}$ | 117.26 (2) | Ru5B$^{vii}$—Al29A—Ru4A$^{ii}$ | 126.87 (19) |
| Al11—Si8—Al24$^{vii}$ | 65.928 (15) | Ru4B$^{ii}$—Al29A—Ru4A$^{ii}$ | 5.9 (4) |
| Al10B—Si8—Al24$^{vii}$ | 66.34 (10) | Si17—Al29A—Ru4A$^{ii}$ | 169.12 (12) |
| Si9B—Si9A—Al22$^{vii}$ | 82.44 (11) | Al32A$^{xvii}$—Al29A—Ru4A$^{ii}$ | 66.40 (11) |
| Si9B—Si9A—Al22 | 82.44 (11) | Al29A$^{xviii}$—Al29A—Ru4A$^{ii}$ | 60.32 (4) |
| Al22$^{vii}$—Si9A—Al22 | 76.04 (3) | Ru1$^{ix}$—Al29A—Ru4A$^{ii}$ | 117.76 (8) |
| Si9B—Si9A—Al12 | 78.41 (14) | Si18—Al29A—Ru4A$^{ii}$ | 58.74 (7) |
| Al22$^{vii}$—Si9A—Al12 | 137.27 (3) | Ru5B$^{vii}$—Al29A—Al29B$^{xviii}$ | 150.30 (15) |
| Al22—Si9A—Al12 | 137.26 (3) | Ru4B$^{ii}$—Al29A—Al29B$^{xviii}$ | 55.6 (2) |
| Si9B—Si9A—Al25$^{ii}$ | 80.16 (5) | Si17—Al29A—Al29B$^{xviii}$ | 113.27 (16) |
| Al22$^{vii}$—Si9A—Al25$^{ii}$ | 67.335 (17) | Al32A$^{xvii}$—Al29A—Al29B$^{xviii}$ | 102.94 (18) |
| Al22—Si9A—Al25$^{ii}$ | 141.05 (4) | Al29A$^{xviii}$—Al29A—Al29B$^{xviii}$ | 7.53 (19) |
| Al12—Si9A—Al25$^{ii}$ | 71.93 (2) | Ru1$^{ix}$—Al29A—Al29B$^{xviii}$ | 65.7 (2) |
| Si9B—Si9A—Al25$^{i}$ | 80.16 (5) | Si18—Al29A—Al29B$^{xviii}$ | 96.40 (12) |
| Al22$^{vii}$—Si9A—Al25$^{i}$ | 141.05 (4) | Ru4A$^{ii}$—Al29A—Al29B$^{xviii}$ | 57.23 (17) |
| Al22—Si9A—Al25$^{i}$ | 67.334 (17) | Ru5B$^{vii}$—Al29A—Al20 | 106.68 (14) |
| Al12—Si9A—Al25$^{i}$ | 71.93 (2) | Ru4B$^{ii}$—Al29A—Al20 | 112.8 (5) |
| Al25$^{ii}$—Si9A—Al25$^{i}$ | 141.54 (4) | Si17—Al29A—Al20 | 78.27 (13) |
| Si9B—Si9A—Al30B$^{i}$ | 146.67 (10) | Al32A$^{xvii}$—Al29A—Al20 | 148.12 (6) |
| Al22$^{vii}$—Si9A—Al30B$^{i}$ | 103.95 (10) | Al29A$^{xviii}$—Al29A—Al20 | 90.59 (3) |
| Al22—Si9A—Al30B$^{i}$ | 67.98 (7) | Ru1$^{ix}$—Al29A—Al20 | 57.28 (11) |
| Al12—Si9A—Al30B$^{i}$ | 113.01 (9) | Si18—Al29A—Al20 | 58.77 (11) |
| Al25$^{ii}$—Si9A—Al30B$^{i}$ | 132.77 (9) | Ru4A$^{ii}$—Al29A—Al20 | 107.26 (14) |
| Al25$^{i}$—Si9A—Al30B$^{i}$ | 74.62 (10) | Al29B$^{xviii}$—Al29A—Al20 | 98.07 (17) |
| Si9B—Si9A—Al30B$^{ii}$ | 146.67 (10) | Ru5B$^{vii}$—Al29A—Ru5A$^{vii}$ | 0.72 (11) |
| Al22$^{vii}$—Si9A—Al30B$^{ii}$ | 67.98 (7) | Ru4B$^{ii}$—Al29A—Ru5A$^{vii}$ | 124.7 (3) |
| Al22—Si9A—Al30B$^{ii}$ | 103.95 (10) | Si17—Al29A—Ru5A$^{vii}$ | 58.34 (4) |
| Al12—Si9A—Al30B$^{ii}$ | 113.01 (9) | Al32A$^{xvii}$—Al29A—Ru5A$^{vii}$ | 63.15 (10) |
| Al25$^{ii}$—Si9A—Al30B$^{ii}$ | 74.62 (10) | Al29A$^{xviii}$—Al29A—Ru5A$^{vii}$ | 156.31 (8) |
| Al25$^{i}$—Si9A—Al30B$^{ii}$ | 132.77 (9) | Ru1$^{ix}$—Al29A—Ru5A$^{vii}$ | 115.09 (6) |

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| Al30B$^{i}$—Si9A—Al30B$^{ii}$ | 60.00 (18) | Si18—Al29A—Ru5A$^{vii}$ | 109.57 (5) |
| Si9A—Si9B—Al12 | 79.39 (14) | Ru4A$^{ii}$—Al29A—Ru5A$^{vii}$ | 126.69 (16) |
| Si9A—Si9B—Al22$^{vii}$ | 75.46 (12) | Al29B$^{xviii}$—Al29A—Ru5A$^{vii}$ | 150.99 (13) |
| Al12—Si9B—Al22$^{vii}$ | 134.37 (7) | Al20—Al29A—Ru5A$^{vii}$ | 106.24 (11) |
| Si9A—Si9B—Al22 | 75.46 (12) | Al32A$^{xvii}$—Al29B—Ru5B$^{vii}$ | 69.7 (3) |
| Al12—Si9B—Al22 | 134.37 (7) | Al32A$^{xvii}$—Al29B—Ru4B$^{ii}$ | 69.5 (4) |
| Al22$^{vii}$—Si9B—Al22 | 73.94 (6) | Ru5B$^{vii}$—Al29B—Ru4B$^{ii}$ | 136.4 (6) |
| Si9A—Si9B—Al25$^{ii}$ | 77.95 (7) | Al32A$^{xvii}$—Al29B—Ru4A$^{ii}$ | 72.7 (3) |
| Al12—Si9B—Al25$^{ii}$ | 71.75 (5) | Ru5B$^{vii}$—Al29B—Ru4A$^{ii}$ | 137.2 (5) |
| Al22$^{vii}$—Si9B—Al25$^{ii}$ | 66.16 (3) | Ru4B$^{ii}$—Al29B—Ru4A$^{ii}$ | 5.9 (4) |
| Al22—Si9B—Al25$^{ii}$ | 136.32 (9) | Al32A$^{xvii}$—Al29B—Al31C$^{xvii}$ | 21.2 (4) |
| Si9A—Si9B—Al25$^{i}$ | 77.95 (7) | Ru5B$^{vii}$—Al29B—Al31C$^{xvii}$ | 88.6 (6) |
| Al12—Si9B—Al25$^{i}$ | 71.75 (5) | Ru4B$^{ii}$—Al29B—Al31C$^{xvii}$ | 55.2 (6) |
| Al22$^{vii}$—Si9B—Al25$^{i}$ | 136.32 (9) | Ru4A$^{ii}$—Al29B—Al31C$^{xvii}$ | 59.8 (4) |
| Al22—Si9B—Al25$^{i}$ | 66.16 (3) | Al32A$^{xvii}$—Al29B—Ru5A$^{vii}$ | 69.4 (3) |
| Al25$^{ii}$—Si9B—Al25$^{i}$ | 139.17 (10) | Ru5B$^{vii}$—Al29B—Ru5A$^{vii}$ | 0.67 (12) |
| Si8—Si10A—Ru5A$^{vii}$ | 113.04 (8) | Ru4B$^{ii}$—Al29B—Ru5A$^{vii}$ | 135.9 (5) |
| Si8—Si10A—Ru5A | 113.04 (8) | Ru4A$^{ii}$—Al29B—Ru5A$^{vii}$ | 136.6 (5) |
| Ru5A$^{vii}$—Si10A—Ru5A | 125.3 (3) | Al31C$^{xvii}$—Al29B—Ru5A$^{vii}$ | 88.4 (5) |
| Si8—Si10A—Al31A$^{vi}$ | 163.35 (15) | Al32A$^{xvii}$—Al29B—Al29A$^{xviii}$ | 118.8 (3) |
| Ru5A$^{vii}$—Si10A—Al31A$^{vi}$ | 63.66 (12) | Ru5B$^{vii}$—Al29B—Al29A$^{xviii}$ | 160.4 (3) |
| Ru5A—Si10A—Al31A$^{vi}$ | 63.66 (12) | Ru4B$^{ii}$—Al29B—Al29A$^{xviii}$ | 59.88 (17) |
| Si8—Si10A—Ru5B | 111.39 (12) | Ru4A$^{ii}$—Al29B—Al29A$^{xviii}$ | 60.44 (13) |
| Ru5A$^{vii}$—Si10A—Ru5B | 127.3 (3) | Al31C$^{xvii}$—Al29B—Al29A$^{xviii}$ | 97.8 (4) |
| Ru5A—Si10A—Ru5B | 2.00 (11) | Ru5A$^{vii}$—Al29B—Al29A$^{xviii}$ | 161.1 (3) |
| Al31A$^{vi}$—Si10A—Ru5B | 65.58 (16) | Al32A$^{xvii}$—Al29B—Si17 | 121.8 (3) |
| Si8—Si10A—Ru5B$^{vii}$ | 111.39 (12) | Ru5B$^{vii}$—Al29B—Si17 | 57.81 (15) |
| Ru5A$^{vii}$—Si10A—Ru5B$^{vii}$ | 2.00 (11) | Ru4B$^{ii}$—Al29B—Si17 | 165.4 (4) |
| Ru5A—Si10A—Ru5B$^{vii}$ | 127.3 (3) | Ru4A$^{ii}$—Al29B—Si17 | 164.7 (5) |
| Al31A$^{vi}$—Si10A—Ru5B$^{vii}$ | 65.58 (16) | Al31C$^{xvii}$—Al29B—Si17 | 132.2 (5) |
| Ru5B—Si10A—Ru5B$^{vii}$ | 129.3 (3) | Ru5A$^{vii}$—Al29B—Si17 | 58.37 (12) |
| Si8—Si10A—Al22$^{vii}$ | 109.66 (18) | Al29A$^{xviii}$—Al29B—Si17 | 105.5 (3) |
| Ru5A$^{vii}$—Si10A—Al22$^{vii}$ | 61.84 (4) | Al32A$^{xvii}$—Al29B—Al29B$^{xviii}$ | 111.79 (14) |
| Ru5A—Si10A—Al22$^{vii}$ | 124.32 (7) | Ru5B$^{vii}$—Al29B—Al29B$^{xviii}$ | 158.92 (15) |
| Al31A$^{vi}$—Si10A—Al22$^{vii}$ | 83.66 (8) | Ru4B$^{ii}$—Al29B—Al29B$^{xviii}$ | 56.5 (2) |
| Ru5B—Si10A—Al22$^{vii}$ | 124.72 (10) | Ru4A$^{ii}$—Al29B—Al29B$^{xviii}$ | 57.86 (17) |
| Ru5B$^{vii}$—Si10A—Al22$^{vii}$ | 61.04 (8) | Al31C$^{xvii}$—Al29B—Al29B$^{xviii}$ | 90.7 (4) |
| Si8—Si10A—Al22 | 109.66 (18) | Ru5A$^{vii}$—Al29B—Al29B$^{xviii}$ | 159.53 (12) |
| Ru5A$^{vii}$—Si10A—Al22 | 124.32 (7) | Al29A$^{xviii}$—Al29B—Al29B$^{xviii}$ | 7.53 (19) |
| Ru5A—Si10A—Al22 | 61.84 (4) | Si17—Al29B—Al29B$^{xviii}$ | 108.96 (16) |
| Al31A$^{vi}$—Si10A—Al22 | 83.66 (8) | Al32A$^{xvii}$—Al29B—Al32B$^{xvii}$ | 18.05 (14) |
| Ru5B—Si10A—Al22 | 61.04 (8) | Ru5B$^{vii}$—Al29B—Al32B$^{xvii}$ | 55.3 (3) |
| Ru5B$^{vii}$—Si10A—Al22 | 124.72 (10) | Ru4B$^{ii}$—Al29B—Al32B$^{xvii}$ | 86.7 (5) |
| Al22$^{vii}$—Si10A—Al22 | 71.31 (5) | Ru4A$^{ii}$—Al29B—Al32B$^{xvii}$ | 90.3 (4) |
| Si8—Si10A—Al23$^{vii}$ | 61.62 (5) | Al31C$^{xvii}$—Al29B—Al32B$^{xvii}$ | 33.4 (4) |
| Ru5A$^{vii}$—Si10A—Al23$^{vii}$ | 62.95 (5) | Ru5A$^{vii}$—Al29B—Al32B$^{xvii}$ | 55.1 (2) |
| Ru5A—Si10A—Al23$^{vii}$ | 119.35 (13) | Al29A$^{xviii}$—Al29B—Al32B$^{xvii}$ | 128.2 (3) |
| Al31A$^{vi}$—Si10A—Al23$^{vii}$ | 104.74 (17) | Si17—Al29B—Al32B$^{xvii}$ | 103.9 (3) |

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| Ru5B—Si10A—Al23$^{vii}$ | 119.82 (14) | Al29B$^{xviii}$—Al29B—Al32B$^{xvii}$ | 120.67 (17) |
| Ru5B$^{vii}$—Si10A—Al23$^{vii}$ | 62.35 (9) | Al32A$^{xvii}$—Al29B—Si18 | 98.6 (3) |
| Al22$^{vii}$—Si10A—Al23$^{vii}$ | 111.61 (3) | Ru5B$^{vii}$—Al29B—Si18 | 108.7 (2) |
| Al22—Si10A—Al23$^{vii}$ | 171.2 (2) | Ru4B$^{ii}$—Al29B—Si18 | 63.5 (5) |
| Si8—Si10A—Al23 | 61.62 (5) | Ru4A$^{ii}$—Al29B—Si18 | 57.63 (13) |
| Ru5A$^{vii}$—Si10A—Al23 | 119.35 (13) | Al31C$^{xvii}$—Al29B—Si18 | 102.0 (4) |
| Ru5A—Si10A—Al23 | 62.95 (5) | Ru5A$^{vii}$—Al29B—Si18 | 108.11 (18) |
| Al31A$^{vi}$—Si10A—Al23 | 104.74 (17) | Al29A$^{xviii}$—Al29B—Si18 | 88.2 (2) |
| Ru5B—Si10A—Al23 | 62.35 (9) | Si17—Al29B—Si18 | 119.6 (5) |
| Ru5B$^{vii}$—Si10A—Al23 | 119.82 (14) | Al29B$^{xviii}$—Al29B—Si18 | 92.09 (12) |
| Al22$^{vii}$—Si10A—Al23 | 171.2 (2) | Al32B$^{xvii}$—Al29B—Si18 | 112.4 (3) |
| Al22—Si10A—Al23 | 111.61 (3) | Al32A$^{xvii}$—Al29B—Ru1$^{ix}$ | 162.7 (3) |
| Al23$^{vii}$—Si10A—Al23 | 64.26 (3) | Ru5B$^{vii}$—Al29B—Ru1$^{ix}$ | 110.0 (3) |
| Si8—Si10A—Al11 | 62.60 (13) | Ru4B$^{ii}$—Al29B—Ru1$^{ix}$ | 113.5 (4) |
| Ru5A$^{vii}$—Si10A—Al11 | 113.16 (11) | Ru4A$^{ii}$—Al29B—Ru1$^{ix}$ | 112.0 (3) |
| Ru5A—Si10A—Al11 | 113.16 (11) | Al31C$^{xvii}$—Al29B—Ru1$^{ix}$ | 146.8 (4) |
| Al31A$^{vi}$—Si10A—Al11 | 134.05 (5) | Ru5A$^{vii}$—Al29B—Ru1$^{ix}$ | 110.5 (3) |
| Ru5B—Si10A—Al11 | 111.49 (14) | Al29A$^{xviii}$—Al29B—Ru1$^{ix}$ | 56.21 (15) |
| Ru5B$^{vii}$—Si10A—Al11 | 111.49 (14) | Si17—Al29B—Ru1$^{ix}$ | 52.7 (2) |
| Al22$^{vii}$—Si10A—Al11 | 59.88 (9) | Al29B$^{xviii}$—Al29B—Ru1$^{ix}$ | 61.96 (12) |
| Al22—Si10A—Al11 | 59.88 (9) | Al32B$^{xvii}$—Al29B—Ru1$^{ix}$ | 149.2 (2) |
| Al23$^{vii}$—Si10A—Al11 | 113.80 (16) | Si18—Al29B—Ru1$^{ix}$ | 97.8 (4) |
| Al23—Si10A—Al11 | 113.80 (16) | Al30B—Al30A—Al27$^{vii}$ | 106.2 (4) |
| Al31A$^{vi}$—Al10B—Ru5A$^{vii}$ | 71.4 (5) | Al30B—Al30A—Ru1$^{ix}$ | 80.6 (4) |
| Al31A$^{vi}$—Al10B—Ru5A | 71.4 (5) | Al27$^{vii}$—Al30A—Ru1$^{ix}$ | 168.32 (11) |
| Ru5A$^{vii}$—Al10B—Ru5A | 141.5 (11) | Al30B—Al30A—Al20 | 87.8 (4) |
| Al31A$^{vi}$—Al10B—Ru5B | 73.0 (5) | Al27$^{vii}$—Al30A—Al20 | 112.19 (5) |
| Ru5A$^{vii}$—Al10B—Ru5B | 143.2 (11) | Ru1$^{ix}$—Al30A—Al20 | 57.91 (2) |
| Ru5A—Al10B—Ru5B | 1.72 (12) | Al30B—Al30A—Ru7$^{xxi}$ | 91.6 (4) |
| Al31A$^{vi}$—Al10B—Ru5B$^{vii}$ | 73.0 (5) | Al27$^{vii}$—Al30A—Ru7$^{xxi}$ | 62.59 (3) |
| Ru5A$^{vii}$—Al10B—Ru5B$^{vii}$ | 1.72 (12) | Ru1$^{ix}$—Al30A—Ru7$^{xxi}$ | 127.54 (4) |
| Ru5A—Al10B—Ru5B$^{vii}$ | 143.2 (11) | Al20—Al30A—Ru7$^{xxi}$ | 174.32 (4) |
| Ru5B—Al10B—Ru5B$^{vii}$ | 144.9 (11) | Al30B—Al30A—Si17 | 135.5 (5) |
| Al31A$^{vi}$—Al10B—Al31B$^{v}$ | 16.12 (19) | Al27$^{vii}$—Al30A—Si17 | 118.23 (16) |
| Ru5A$^{vii}$—Al10B—Al31B$^{v}$ | 58.7 (4) | Ru1$^{ix}$—Al30A—Si17 | 55.77 (3) |
| Ru5A—Al10B—Al31B$^{v}$ | 86.1 (7) | Al20—Al30A—Si17 | 76.97 (5) |
| Ru5B—Al10B—Al31B$^{v}$ | 87.6 (6) | Ru7$^{xxi}$—Al30A—Si17 | 107.23 (10) |
| Ru5B$^{vii}$—Al10B—Al31B$^{v}$ | 60.2 (4) | Al30B—Al30A—Al21$^{vii}$ | 143.3 (4) |
| Al31A$^{vi}$—Al10B—Al31B$^{vi}$ | 16.12 (19) | Al27$^{vii}$—Al30A—Al21$^{vii}$ | 72.38 (8) |
| Ru5A$^{vii}$—Al10B—Al31B$^{vi}$ | 86.1 (7) | Ru1$^{ix}$—Al30A—Al21$^{vii}$ | 107.95 (8) |
| Ru5A—Al10B—Al31B$^{vi}$ | 58.7 (4) | Al20—Al30A—Al21$^{vii}$ | 127.46 (14) |
| Ru5B—Al10B—Al31B$^{vi}$ | 60.2 (4) | Ru7$^{xxi}$—Al30A—Al21$^{vii}$ | 54.39 (5) |
| Ru5B$^{vii}$—Al10B—Al31B$^{vi}$ | 87.6 (6) | Si17—Al30A—Al21$^{vii}$ | 58.36 (8) |
| Al31B$^{v}$—Al10B—Al31B$^{vi}$ | 27.7 (4) | Al30B—Al30A—Al14$^{ix}$ | 73.0 (4) |
| Al31A$^{vi}$—Al10B—Al23$^{vii}$ | 115.5 (7) | Al27$^{vii}$—Al30A—Al14$^{ix}$ | 127.62 (4) |
| Ru5A$^{vii}$—Al10B—Al23$^{vii}$ | 64.74 (13) | Ru1$^{ix}$—Al30A—Al14$^{ix}$ | 63.04 (4) |
| Ru5A—Al10B—Al23$^{vii}$ | 125.3 (4) | Al20—Al30A—Al14$^{ix}$ | 120.03 (7) |
| Ru5B—Al10B—Al23$^{vii}$ | 125.3 (4) | Ru7$^{xxi}$—Al30A—Al14$^{ix}$ | 65.06 (3) |

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| Ru5B$^{vii}$—Al10B—Al23$^{vii}$ | 64.05 (14) | Si17—Al30A—Al14$^{ix}$ | 79.00 (4) |
| Al31B$^{v}$—Al10B—Al23$^{vii}$ | 112.9 (6) | Al21$^{vii}$—Al30A—Al14$^{ix}$ | 79.39 (4) |
| Al31B$^{vi}$—Al10B—Al23$^{vii}$ | 130.1 (8) | Al30B—Al30A—Ru6$^{vii}$ | 114.5 (4) |
| Al31A$^{vi}$—Al10B—Al23 | 115.5 (7) | Al27$^{vii}$—Al30A—Ru6$^{vii}$ | 59.08 (4) |
| Ru5A$^{vii}$—Al10B—Al23 | 125.3 (4) | Ru1$^{ix}$—Al30A—Ru6$^{vii}$ | 109.64 (4) |
| Ru5A—Al10B—Al23 | 64.74 (13) | Al20—Al30A—Ru6$^{vii}$ | 54.97 (3) |
| Ru5B—Al10B—Al23 | 64.05 (14) | Ru7$^{xxi}$—Al30A—Ru6$^{vii}$ | 120.50 (8) |
| Ru5B$^{vii}$—Al10B—Al23 | 125.3 (4) | Si17—Al30A—Ru6$^{vii}$ | 90.49 (10) |
| Al31B$^{v}$—Al10B—Al23 | 130.1 (8) | Al21$^{vii}$—Al30A—Ru6$^{vii}$ | 96.54 (12) |
| Al31B$^{vi}$—Al10B—Al23 | 112.9 (6) | Al14$^{ix}$—Al30A—Ru6$^{vii}$ | 169.37 (11) |
| Al23$^{vii}$—Al10B—Al23 | 64.31 (19) | Al30A—Al30B—Ru1$^{ix}$ | 88.0 (5) |
| Al31A$^{vi}$—Al10B—Al22$^{vii}$ | 88.0 (3) | Al30A—Al30B—Al20 | 81.1 (4) |
| Ru5A$^{vii}$—Al10B—Al22$^{vii}$ | 61.92 (12) | Ru1$^{ix}$—Al30B—Al20 | 57.90 (7) |
| Ru5A—Al10B—Al22$^{vii}$ | 126.1 (3) | Al30A—Al30B—Al30B$^{xviii}$ | 144.1 (4) |
| Ru5B—Al10B—Al22$^{vii}$ | 126.1 (3) | Ru1$^{ix}$—Al30B—Al30B$^{xviii}$ | 58.35 (17) |
| Ru5B$^{vii}$—Al10B—Al22$^{vii}$ | 61.19 (13) | Al20—Al30B—Al30B$^{xviii}$ | 89.59 (13) |
| Al31B$^{v}$—Al10B—Al22$^{vii}$ | 73.5 (3) | Al30A—Al30B—Si9A$^{ix}$ | 151.0 (5) |
| Al31B$^{vi}$—Al10B—Al22$^{vii}$ | 89.1 (3) | Ru1$^{ix}$—Al30B—Si9A$^{ix}$ | 105.2 (2) |
| Al23$^{vii}$—Al10B—Al22$^{vii}$ | 108.6 (3) | Al20—Al30B—Si9A$^{ix}$ | 84.30 (13) |
| Al23—Al10B—Al22$^{vii}$ | 156.4 (10) | Al30B$^{xviii}$—Al30B—Si9A$^{ix}$ | 60.00 (9) |
| Al31A$^{vi}$—Al10B—Al22 | 88.0 (3) | Al30A—Al30B—Al14$^{ix}$ | 96.5 (5) |
| Ru5A$^{vii}$—Al10B—Al22 | 126.1 (3) | Ru1$^{ix}$—Al30B—Al14$^{ix}$ | 64.97 (8) |
| Ru5A—Al10B—Al22 | 61.92 (12) | Al20—Al30B—Al14$^{ix}$ | 122.86 (13) |
| Ru5B—Al10B—Al22 | 61.19 (13) | Al30B$^{xviii}$—Al30B—Al14$^{ix}$ | 60.05 (14) |
| Ru5B$^{vii}$—Al10B—Al22 | 126.1 (3) | Si9A$^{ix}$—Al30B—Al14$^{ix}$ | 112.4 (2) |
| Al31B$^{v}$—Al10B—Al22 | 89.1 (3) | Al30A—Al30B—Ru7$^{xxi}$ | 77.7 (4) |
| Al31B$^{vi}$—Al10B—Al22 | 73.5 (3) | Ru1$^{ix}$—Al30B—Ru7$^{xxi}$ | 126.25 (15) |
| Al23$^{vii}$—Al10B—Al22 | 156.4 (10) | Al20—Al30B—Ru7$^{xxi}$ | 158.1 (3) |
| Al23—Al10B—Al22 | 108.6 (3) | Al30B$^{xviii}$—Al30B—Ru7$^{xxi}$ | 110.95 (13) |
| Al22$^{vii}$—Al10B—Al22 | 68.3 (3) | Si9A$^{ix}$—Al30B—Ru7$^{xxi}$ | 112.11 (19) |
| Ru7—Al11—Ru7$^{vii}$ | 134.87 (3) | Al14$^{ix}$—Al30B—Ru7$^{xxi}$ | 65.67 (7) |
| Ru7—Al11—Al26$^{vii}$ | 119.96 (3) | Al30A—Al30B—Al27$^{vii}$ | 63.6 (4) |
| Ru7$^{vii}$—Al11—Al26$^{vii}$ | 62.525 (13) | Ru1$^{ix}$—Al30B—Al27$^{vii}$ | 150.0 (3) |
| Ru7—Al11—Al26 | 62.525 (14) | Al20—Al30B—Al27$^{vii}$ | 105.66 (16) |
| Ru7$^{vii}$—Al11—Al26 | 119.96 (3) | Al30B$^{xviii}$—Al30B—Al27$^{vii}$ | 151.45 (14) |
| Al26$^{vii}$—Al11—Al26 | 62.69 (2) | Si9A$^{ix}$—Al30B—Al27$^{vii}$ | 96.97 (13) |
| Ru7—Al11—Al22$^{vii}$ | 130.54 (3) | Al14$^{ix}$—Al30B—Al27$^{vii}$ | 124.23 (15) |
| Ru7$^{vii}$—Al11—Al22$^{vii}$ | 66.435 (13) | Ru7$^{xxi}$—Al30B—Al27$^{vii}$ | 59.49 (8) |
| Al26$^{vii}$—Al11—Al22$^{vii}$ | 109.406 (16) | Al30A—Al30B—Al22$^{xxi}$ | 118.9 (5) |
| Al26—Al11—Al22$^{vii}$ | 157.46 (3) | Ru1$^{ix}$—Al30B—Al22$^{xxi}$ | 152.7 (3) |
| Ru7—Al11—Al22 | 66.435 (13) | Al20—Al30B—Al22$^{xxi}$ | 126.71 (16) |
| Ru7$^{vii}$—Al11—Al22 | 130.54 (3) | Al30B$^{xviii}$—Al30B—Al22$^{xxi}$ | 94.41 (13) |
| Al26$^{vii}$—Al11—Al22 | 157.46 (3) | Si9A$^{ix}$—Al30B—Al22$^{xxi}$ | 53.74 (12) |
| Al26—Al11—Al22 | 109.406 (16) | Al14$^{ix}$—Al30B—Al22$^{xxi}$ | 104.43 (15) |
| Al22$^{vii}$—Al11—Al22 | 69.28 (3) | Ru7$^{xxi}$—Al30B—Al22$^{xxi}$ | 61.37 (7) |
| Ru7—Al11—Al14 | 67.460 (14) | Al27$^{vii}$—Al30B—Al22$^{xxi}$ | 57.09 (7) |
| Ru7$^{vii}$—Al11—Al14 | 67.460 (14) | Al31B$^{vii}$—Al31A—Al31B | 104.6 (8) |
| Al26$^{vii}$—Al11—Al14 | 95.15 (2) | Al31B$^{vii}$—Al31A—Al31C | 111.1 (6) |

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| Al26—Al11—Al14 | 95.15 (2) | Al31B—Al31A—Al31C | 7.5 (6) |
| Al22$^{vii}$—Al11—Al14 | 106.85 (2) | Al31B$^{vii}$—Al31A—Al31C$^{vii}$ | 7.5 (6) |
| Al22—Al11—Al14 | 106.85 (2) | Al31B—Al31A—Al31C$^{vii}$ | 111.1 (6) |
| Ru7—Al11—Si8 | 108.159 (15) | Al31C—Al31A—Al31C$^{vii}$ | 117.4 (8) |
| Ru7$^{vii}$—Al11—Si8 | 108.160 (15) | Al31B$^{vii}$—Al31A—Al10B$^{xv}$ | 113.3 (4) |
| Al26$^{vii}$—Al11—Si8 | 57.477 (18) | Al31B—Al31A—Al10B$^{xv}$ | 113.3 (4) |
| Al26—Al11—Si8 | 57.478 (18) | Al31C—Al31A—Al10B$^{xv}$ | 112.4 (4) |
| Al22$^{vii}$—Al11—Si8 | 100.13 (2) | Al31C$^{vii}$—Al31A—Al10B$^{xv}$ | 112.4 (4) |
| Al22—Al11—Si8 | 100.13 (2) | Al31B$^{vii}$—Al31A—Ru4B | 63.1 (4) |
| Al14—Al11—Si8 | 147.02 (3) | Al31B—Al31A—Ru4B | 63.1 (4) |
| Ru7—Al11—Si10A | 111.479 (16) | Al31C—Al31A—Ru4B | 65.0 (4) |
| Ru7$^{vii}$—Al11—Si10A | 111.479 (16) | Al31C$^{vii}$—Al31A—Ru4B | 65.0 (4) |
| Al26$^{vii}$—Al11—Si10A | 102.01 (5) | Al10B$^{xv}$—Al31A—Ru4B | 172.6 (4) |
| Al26—Al11—Si10A | 102.01 (5) | Al31B$^{vii}$—Al31A—Al32A$^{vii}$ | 8.9 (4) |
| Al22$^{vii}$—Al11—Si10A | 57.51 (4) | Al31B—Al31A—Al32A$^{vii}$ | 112.1 (4) |
| Al22—Al11—Si10A | 57.51 (4) | Al31C—Al31A—Al32A$^{vii}$ | 118.2 (4) |
| Al14—Al11—Si10A | 159.87 (6) | Al31C$^{vii}$—Al31A—Al32A$^{vii}$ | 1.6 (4) |
| Si8—Al11—Si10A | 53.11 (5) | Al10B$^{xv}$—Al31A—Al32A$^{vii}$ | 112.72 (12) |
| Ru1$^{iv}$—Al12—Si9B | 105.42 (6) | Ru4B—Al31A—Al32A$^{vii}$ | 64.82 (9) |
| Ru1$^{iv}$—Al12—Si9A | 127.62 (3) | Al31B$^{vii}$—Al31A—Al32A | 112.1 (4) |
| Si9B—Al12—Si9A | 22.19 (6) | Al31B—Al31A—Al32A | 8.9 (4) |
| Ru1$^{iv}$—Al12—Ru2 | 117.87 (3) | Al31C—Al31A—Al32A | 1.6 (4) |
| Si9B—Al12—Ru2 | 136.71 (7) | Al31C$^{vii}$—Al31A—Al32A | 118.2 (4) |
| Si9A—Al12—Ru2 | 114.52 (3) | Al10B$^{xv}$—Al31A—Al32A | 112.72 (12) |
| Ru1$^{iv}$—Al12—Si16$^{ii}$ | 105.283 (19) | Ru4B—Al31A—Al32A | 64.82 (9) |
| Si9B—Al12—Si16$^{ii}$ | 111.35 (3) | Al32A$^{vii}$—Al31A—Al32A | 119.08 (6) |
| Si9A—Al12—Si16$^{ii}$ | 101.29 (2) | Al31B$^{vii}$—Al31A—Si10A$^{xv}$ | 111.3 (4) |
| Ru2—Al12—Si16$^{ii}$ | 58.581 (15) | Al31B—Al31A—Si10A$^{xv}$ | 111.3 (4) |
| Ru1$^{iv}$—Al12—Si16$^{i}$ | 105.283 (19) | Al31C—Al31A—Si10A$^{xv}$ | 110.9 (4) |
| Si9B—Al12—Si16$^{i}$ | 111.35 (3) | Al31C$^{vii}$—Al31A—Si10A$^{xv}$ | 110.9 (4) |
| Si9A—Al12—Si16$^{i}$ | 101.29 (2) | Al10B$^{xv}$—Al31A—Si10A$^{xv}$ | 3.7 (3) |
| Ru2—Al12—Si16$^{i}$ | 58.581 (15) | Ru4B—Al31A—Si10A$^{xv}$ | 168.9 (3) |
| Si16$^{ii}$—Al12—Si16$^{i}$ | 117.10 (3) | Al32A$^{vii}$—Al31A—Si10A$^{xv}$ | 111.36 (4) |
| Ru1$^{iv}$—Al12—Si17$^{xii}$ | 56.847 (15) | Al32A—Al31A—Si10A$^{xv}$ | 111.36 (4) |
| Si9B—Al12—Si17$^{xii}$ | 96.74 (4) | Al31B$^{vii}$—Al31A—Si19$^{vii}$ | 97.6 (4) |
| Si9A—Al12—Si17$^{xii}$ | 108.10 (2) | Al31B—Al31A—Si19$^{vii}$ | 148.1 (4) |
| Ru2—Al12—Si17$^{xii}$ | 106.339 (18) | Al31C—Al31A—Si19$^{vii}$ | 140.9 (4) |
| Si16$^{ii}$—Al12—Si17$^{xii}$ | 56.184 (13) | Al31C$^{vii}$—Al31A—Si19$^{vii}$ | 90.2 (4) |
| Si16$^{i}$—Al12—Si17$^{xii}$ | 150.58 (3) | Al10B$^{xv}$—Al31A—Si19$^{vii}$ | 77.3 (3) |
| Ru1$^{iv}$—Al12—Si17$^{xiii}$ | 56.847 (15) | Ru4B—Al31A—Si19$^{vii}$ | 109.3 (2) |
| Si9B—Al12—Si17$^{xiii}$ | 96.74 (4) | Al32A$^{vii}$—Al31A—Si19$^{vii}$ | 88.77 (2) |
| Si9A—Al12—Si17$^{xiii}$ | 108.10 (2) | Al32A—Al31A—Si19$^{vii}$ | 139.39 (4) |
| Ru2—Al12—Si17$^{xiii}$ | 106.339 (18) | Si10A$^{xv}$—Al31A—Si19$^{vii}$ | 80.56 (6) |
| Si16$^{ii}$—Al12—Si17$^{xiii}$ | 150.58 (3) | Al31B$^{vii}$—Al31A—Si19 | 148.1 (4) |
| Si16$^{i}$—Al12—Si17$^{xiii}$ | 56.184 (13) | Al31B—Al31A—Si19 | 97.6 (4) |
| Si17$^{xii}$—Al12—Si17$^{xiii}$ | 113.59 (3) | Al31C—Al31A—Si19 | 90.2 (4) |
| Ru1$^{iv}$—Al12—Al14$^{iv}$ | 60.71 (2) | Al31C$^{vii}$—Al31A—Si19 | 140.9 (4) |
| Si9B—Al12—Al14$^{iv}$ | 166.13 (7) | Al10B$^{xv}$—Al31A—Si19 | 77.3 (3) |

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| Si9A—Al12—Al14$^{iv}$ | 171.68 (4) | Ru4B—Al31A—Si19 | 109.3 (2) |
| Ru2—Al12—Al14$^{iv}$ | 57.157 (19) | Al32A$^{vii}$—Al31A—Si19 | 139.39 (4) |
| Si16$^{ii}$—Al12—Al14$^{iv}$ | 74.706 (18) | Al32A—Al31A—Si19 | 88.77 (2) |
| Si16$^{i}$—Al12—Al14$^{iv}$ | 74.706 (18) | Si10A$^{xv}$—Al31A—Si19 | 80.55 (6) |
| Si17$^{xii}$—Al12—Al14$^{iv}$ | 75.984 (18) | Si19$^{vii}$—Al31A—Si19 | 53.85 (3) |
| Si17$^{xiii}$—Al12—Al14$^{iv}$ | 75.984 (18) | Al31B$^{vii}$—Al31A—Ru5A$^{xv}$ | 155.4 (4) |
| Ru4B—Al13—Ru4A | 6.2 (4) | Al31B—Al31A—Ru5A$^{xv}$ | 66.3 (4) |
| Ru4B—Al13—Si8 | 164.9 (5) | Al31C—Al31A—Ru5A$^{xv}$ | 61.9 (4) |
| Ru4A—Al13—Si8 | 158.75 (8) | Al31C$^{vii}$—Al31A—Ru5A$^{xv}$ | 161.0 (4) |
| Ru4B—Al13—Si19$^{vii}$ | 109.2 (4) | Al10B$^{xv}$—Al31A—Ru5A$^{xv}$ | 56.37 (5) |
| Ru4A—Al13—Si19$^{vii}$ | 114.51 (6) | Ru4B—Al31A—Ru5A$^{xv}$ | 123.97 (4) |
| Si8—Al13—Si19$^{vii}$ | 84.06 (2) | Al32A$^{vii}$—Al31A—Ru5A$^{xv}$ | 162.40 (5) |
| Ru4B—Al13—Si19 | 109.2 (4) | Al32A—Al31A—Ru5A$^{xv}$ | 61.54 (4) |
| Ru4A—Al13—Si19 | 114.51 (6) | Si10A$^{xv}$—Al31A—Ru5A$^{xv}$ | 56.78 (4) |
| Si8—Al13—Si19 | 84.06 (2) | Si19$^{vii}$—Al31A—Ru5A$^{xv}$ | 100.90 (5) |
| Si19$^{vii}$—Al13—Si19 | 55.57 (2) | Si19—Al31A—Ru5A$^{xv}$ | 55.81 (3) |
| Ru4B—Al13—Ru6$^{vii}$ | 121.61 (3) | Al31A—Al31B—Al31C | 165.1 (12) |
| Ru4A—Al13—Ru6$^{vii}$ | 121.078 (15) | Al31A—Al31B—Al31B$^{vii}$ | 37.7 (4) |
| Si8—Al13—Ru6$^{vii}$ | 58.794 (12) | Al31C—Al31B—Al31B$^{vii}$ | 154.5 (10) |
| Si19$^{vii}$—Al13—Ru6$^{vii}$ | 57.940 (13) | Al31A—Al31B—Al32A | 166.9 (6) |
| Si19—Al13—Ru6$^{vii}$ | 105.19 (2) | Al31C—Al31B—Al32A | 2.0 (9) |
| Ru4B—Al13—Ru6 | 121.61 (3) | Al31B$^{vii}$—Al31B—Al32A | 152.61 (19) |
| Ru4A—Al13—Ru6 | 121.078 (15) | Al31A—Al31B—Al31C$^{vii}$ | 47.2 (5) |
| Si8—Al13—Ru6 | 58.794 (12) | Al31C—Al31B—Al31C$^{vii}$ | 144.7 (13) |
| Si19$^{vii}$—Al13—Ru6 | 105.19 (2) | Al31B$^{vii}$—Al31B—Al31C$^{vii}$ | 9.9 (4) |
| Si19—Al13—Ru6 | 57.941 (13) | Al32A—Al31B—Al31C$^{vii}$ | 142.7 (5) |
| Ru6$^{vii}$—Al13—Ru6 | 116.50 (2) | Al31A—Al31B—Ru4B | 97.9 (5) |
| Ru4B—Al13—Al27 | 60.94 (17) | Al31C—Al31B—Ru4B | 85.6 (10) |
| Ru4A—Al13—Al27 | 59.05 (2) | Al31B$^{vii}$—Al31B—Ru4B | 73.2 (3) |
| Si8—Al13—Al27 | 113.14 (2) | Al32A—Al31B—Ru4B | 84.3 (3) |
| Si19$^{vii}$—Al13—Al27 | 141.60 (3) | Al31C$^{vii}$—Al31B—Ru4B | 65.2 (4) |
| Si19—Al13—Al27 | 90.892 (17) | Al31A—Al31B—Al32B | 156.6 (6) |
| Ru6$^{vii}$—Al13—Al27 | 160.34 (3) | Al31C—Al31B—Al32B | 20.9 (9) |
| Ru6—Al13—Al27 | 62.650 (11) | Al31B$^{vii}$—Al31B—Al32B | 158.02 (18) |
| Ru4B—Al13—Al27$^{vii}$ | 60.94 (17) | Al32A—Al31B—Al32B | 21.53 (15) |
| Ru4A—Al13—Al27$^{vii}$ | 59.05 (2) | Al31C$^{vii}$—Al31B—Al32B | 151.1 (5) |
| Si8—Al13—Al27$^{vii}$ | 113.14 (2) | Ru4B—Al31B—Al32B | 104.7 (4) |
| Si19$^{vii}$—Al13—Al27$^{vii}$ | 90.892 (16) | Al31A—Al31B—Ru4A | 98.4 (5) |
| Si19—Al13—Al27$^{vii}$ | 141.60 (3) | Al31C—Al31B—Ru4A | 84.4 (10) |
| Ru6$^{vii}$—Al13—Al27$^{vii}$ | 62.650 (11) | Al31B$^{vii}$—Al31B—Ru4A | 74.96 (19) |
| Ru6—Al13—Al27$^{vii}$ | 160.34 (3) | Al32A—Al31B—Ru4A | 83.2 (3) |
| Al27—Al13—Al27$^{vii}$ | 110.94 (3) | Al31C$^{vii}$—Al31B—Ru4A | 67.2 (4) |
| Ru4B—Al13—Al31A | 55.7 (5) | Ru4B—Al31B—Ru4A | 2.6 (2) |
| Ru4A—Al13—Al31A | 61.84 (7) | Al32B—Al31B—Ru4A | 103.9 (3) |
| Si8—Al13—Al31A | 139.41 (4) | Al31A—Al31B—Ru5A$^{xv}$ | 96.4 (4) |
| Si19$^{vii}$—Al13—Al31A | 60.45 (3) | Al31C—Al31B—Ru5A$^{xv}$ | 74.8 (10) |
| Si19—Al13—Al31A | 60.45 (3) | Al31B$^{vii}$—Al31B—Ru5A$^{xv}$ | 130.0 (2) |
| Ru6$^{vii}$—Al13—Al31A | 109.49 (2) | Al32A—Al31B—Ru5A$^{xv}$ | 76.5 (2) |

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| Ru6—Al13—Al31A | 109.49 (2) | Al31C$^{vii}$—Al31B—Ru5A$^{xv}$ | 139.5 (5) |
| Al27—Al13—Al31A | 88.14 (2) | Ru4B—Al31B—Ru5A$^{xv}$ | 151.4 (4) |
| Al27$^{vii}$—Al13—Al31A | 88.14 (2) | Al32B—Al31B—Ru5A$^{xv}$ | 60.6 (2) |
| Ru4B—Al13—Al31B | 47.2 (5) | Ru4A—Al31B—Ru5A$^{xv}$ | 148.9 (3) |
| Ru4A—Al13—Al31B | 53.11 (14) | Al31A—Al31B—Ru5B$^{xv}$ | 98.5 (5) |
| Si8—Al13—Al31B | 146.96 (12) | Al31C—Al31B—Ru5B$^{xv}$ | 72.6 (10) |
| Si19$^{vii}$—Al13—Al31B | 75.54 (16) | Al31B$^{vii}$—Al31B—Ru5B$^{xv}$ | 132.1 (2) |
| Si19—Al13—Al31B | 62.99 (11) | Al32A—Al31B—Ru5B$^{xv}$ | 74.3 (2) |
| Ru6$^{vii}$—Al13—Al31B | 125.08 (16) | Al31C$^{vii}$—Al31B—Ru5B$^{xv}$ | 141.5 (5) |
| Ru6—Al13—Al31B | 101.66 (13) | Ru4B—Al31B—Ru5B$^{xv}$ | 150.0 (4) |
| Al27—Al13—Al31B | 72.19 (16) | Al32B—Al31B—Ru5B$^{xv}$ | 58.5 (2) |
| Al27$^{vii}$—Al13—Al31B | 93.16 (12) | Ru4A—Al31B—Ru5B$^{xv}$ | 147.5 (3) |
| Al31A—Al13—Al31B | 15.97 (15) | Ru5A$^{xv}$—Al31B—Ru5B$^{xv}$ | 2.15 (10) |
| Ru4B—Al13—Al31B$^{vii}$ | 47.2 (5) | Al31A—Al31B—Al10B$^{xv}$ | 50.6 (4) |
| Ru4A—Al13—Al31B$^{vii}$ | 53.11 (14) | Al31C—Al31B—Al10B$^{xv}$ | 126.5 (10) |
| Si8—Al13—Al31B$^{vii}$ | 146.96 (12) | Al31B$^{vii}$—Al31B—Al10B$^{xv}$ | 76.16 (19) |
| Si19$^{vii}$—Al13—Al31B$^{vii}$ | 62.99 (11) | Al32A—Al31B—Al10B$^{xv}$ | 127.8 (3) |
| Si19—Al13—Al31B$^{vii}$ | 75.53 (16) | Al31C$^{vii}$—Al31B—Al10B$^{xv}$ | 85.1 (4) |
| Ru6$^{vii}$—Al13—Al31B$^{vii}$ | 101.66 (13) | Ru4B—Al31B—Al10B$^{xv}$ | 147.8 (4) |
| Ru6—Al13—Al31B$^{vii}$ | 125.08 (16) | Al32B—Al31B—Al10B$^{xv}$ | 107.4 (3) |
| Al27—Al13—Al31B$^{vii}$ | 93.16 (12) | Ru4A—Al31B—Al10B$^{xv}$ | 148.8 (4) |
| Al27$^{vii}$—Al13—Al31B$^{vii}$ | 72.19 (16) | Ru5A$^{xv}$—Al31B—Al10B$^{xv}$ | 54.54 (15) |
| Al31A—Al13—Al31B$^{vii}$ | 15.97 (15) | Ru5B$^{xv}$—Al31B—Al10B$^{xv}$ | 56.55 (17) |
| Al31B—Al13—Al31B$^{vii}$ | 25.3 (3) | Al31A—Al31B—Si19 | 66.3 (4) |
| Al30B$^{ii}$—Al14—Al30B$^{i}$ | 59.9 (3) | Al31C—Al31B—Si19 | 98.8 (9) |
| Al30B$^{ii}$—Al14—Ru2$^{iii}$ | 141.14 (16) | Al31B$^{vii}$—Al31B—Si19 | 101.39 (16) |
| Al30B$^{i}$—Al14—Ru2$^{iii}$ | 141.14 (16) | Al32A—Al31B—Si19 | 100.7 (2) |
| Al30B$^{ii}$—Al14—Al11 | 75.89 (12) | Al31C$^{vii}$—Al31B—Si19 | 109.1 (4) |
| Al30B$^{i}$—Al14—Al11 | 75.89 (12) | Ru4B—Al31B—Si19 | 109.4 (3) |
| Ru2$^{iii}$—Al14—Al11 | 132.37 (3) | Al32B—Al31B—Si19 | 99.9 (2) |
| Al30B$^{ii}$—Al14—Al28$^{xi}$ | 162.41 (16) | Ru4A—Al31B—Si19 | 107.26 (19) |
| Al30B$^{i}$—Al14—Al28$^{xi}$ | 107.05 (13) | Ru5A$^{xv}$—Al31B—Si19 | 55.09 (12) |
| Ru2$^{iii}$—Al14—Al28$^{xi}$ | 56.454 (17) | Ru5B$^{xv}$—Al31B—Si19 | 56.06 (14) |
| Al11—Al14—Al28$^{xi}$ | 89.86 (2) | Al10B$^{xv}$—Al31B—Si19 | 67.3 (3) |
| Al30B$^{ii}$—Al14—Al28$^{xiv}$ | 107.05 (13) | Al31B—Al31C—Al32A | 176.2 (17) |
| Al30B$^{i}$—Al14—Al28$^{xiv}$ | 162.41 (16) | Al31B—Al31C—Al32B | 148.0 (14) |
| Ru2$^{iii}$—Al14—Al28$^{xiv}$ | 56.454 (17) | Al32A—Al31C—Al32B | 33.2 (5) |
| Al11—Al14—Al28$^{xiv}$ | 89.86 (2) | Al31B—Al31C—Al31A | 7.4 (6) |
| Al28$^{xi}$—Al14—Al28$^{xiv}$ | 82.78 (3) | Al32A—Al31C—Al31A | 175.7 (11) |
| Al30B$^{ii}$—Al14—Al30A$^{ii}$ | 10.48 (9) | Al32B—Al31C—Al31A | 148.5 (9) |
| Al30B$^{i}$—Al14—Al30A$^{ii}$ | 69.2 (2) | Al31B—Al31C—Al31B$^{vii}$ | 15.6 (6) |
| Ru2$^{iii}$—Al14—Al30A$^{ii}$ | 130.97 (8) | Al32A—Al31C—Al31B$^{vii}$ | 160.7 (11) |
| Al11—Al14—Al30A$^{ii}$ | 82.35 (6) | Al32B—Al31C—Al31B$^{vii}$ | 153.5 (8) |
| Al28$^{xi}$—Al14—Al30A$^{ii}$ | 171.95 (7) | Al31A—Al31C—Al31B$^{vii}$ | 21.6 (2) |
| Al28$^{xiv}$—Al14—Al30A$^{ii}$ | 99.12 (7) | Al31B—Al31C—Al32B$^{xix}$ | 138.0 (12) |
| Al30B$^{ii}$—Al14—Al30A$^{i}$ | 69.2 (2) | Al32A—Al31C—Al32B$^{xix}$ | 43.3 (6) |
| Al30B$^{i}$—Al14—Al30A$^{i}$ | 10.48 (9) | Al32B—Al31C—Al32B$^{xix}$ | 10.2 (3) |
| Ru2$^{iii}$—Al14—Al30A$^{i}$ | 130.97 (8) | Al31A—Al31C—Al32B$^{xix}$ | 138.3 (7) |

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| Al11—Al14—Al30A$^{i}$ | 82.35 (6) | Al31B$^{vii}$—Al31C—Al32B$^{xix}$ | 145.3 (7) |
| Al28$^{xi}$—Al14—Al30A$^{i}$ | 99.12 (7) | Al31B—Al31C—Ru4B | 73.8 (10) |
| Al28$^{xiv}$—Al14—Al30A$^{i}$ | 171.95 (7) | Al32A—Al31C—Ru4B | 103.9 (9) |
| Al30A$^{ii}$—Al14—Al30A$^{i}$ | 77.95 (15) | Al32B—Al31C—Ru4B | 134.7 (9) |
| Al30B$^{ii}$—Al14—Ru1 | 55.27 (7) | Al31A—Al31C—Ru4B | 75.7 (6) |
| Al30B$^{i}$—Al14—Ru1 | 55.27 (7) | Al31B$^{vii}$—Al31C—Ru4B | 61.0 (5) |
| Ru2$^{iii}$—Al14—Ru1 | 105.08 (2) | Al32B$^{xix}$—Al31C—Ru4B | 144.0 (7) |
| Al11—Al14—Ru1 | 122.55 (3) | Al31B—Al31C—Ru5A$^{xv}$ | 86.2 (10) |
| Al28$^{xi}$—Al14—Ru1 | 129.33 (2) | Al32A—Al31C—Ru5A$^{xv}$ | 97.1 (9) |
| Al28$^{xiv}$—Al14—Ru1 | 129.33 (2) | Al32B—Al31C—Ru5A$^{xv}$ | 71.3 (5) |
| Al30A$^{ii}$—Al14—Ru1 | 54.97 (2) | Al31A—Al31C—Ru5A$^{xv}$ | 81.9 (5) |
| Al30A$^{i}$—Al14—Ru1 | 54.97 (2) | Al31B$^{vii}$—Al31C—Ru5A$^{xv}$ | 101.4 (6) |
| Al30B$^{ii}$—Al14—Ru7$^{vii}$ | 57.95 (8) | Al32B$^{xix}$—Al31C—Ru5A$^{xv}$ | 63.2 (3) |
| Al30B$^{i}$—Al14—Ru7$^{vii}$ | 104.88 (16) | Ru4B—Al31C—Ru5A$^{xv}$ | 151.1 (7) |
| Ru2$^{iii}$—Al14—Ru7$^{vii}$ | 113.742 (17) | Al31B—Al31C—Ru5B$^{xv}$ | 89.1 (10) |
| Al11—Al14—Ru7$^{vii}$ | 52.088 (11) | Al32A—Al31C—Ru5B$^{xv}$ | 94.1 (9) |
| Al28$^{xi}$—Al14—Ru7$^{vii}$ | 120.55 (3) | Al32B—Al31C—Ru5B$^{xv}$ | 68.6 (5) |
| Al28$^{xiv}$—Al14—Ru7$^{vii}$ | 57.677 (13) | Al31A—Al31C—Ru5B$^{xv}$ | 84.9 (5) |
| Al30A$^{ii}$—Al14—Ru7$^{vii}$ | 55.52 (2) | Al31B$^{vii}$—Al31C—Ru5B$^{xv}$ | 104.4 (6) |
| Al30A$^{i}$—Al14—Ru7$^{vii}$ | 115.22 (9) | Al32B$^{xix}$—Al31C—Ru5B$^{xv}$ | 60.6 (3) |
| Ru1—Al14—Ru7$^{vii}$ | 110.100 (17) | Ru4B—Al31C—Ru5B$^{xv}$ | 153.2 (6) |
| Al30B$^{ii}$—Al14—Ru7 | 104.88 (16) | Ru5A$^{xv}$—Al31C—Ru5B$^{xv}$ | 2.97 (11) |
| Al30B$^{i}$—Al14—Ru7 | 57.95 (8) | Al31B—Al31C—Ru4A | 76.9 (10) |
| Ru2$^{iii}$—Al14—Ru7 | 113.743 (17) | Al32A—Al31C—Ru4A | 100.9 (9) |
| Al11—Al14—Ru7 | 52.087 (11) | Al32B—Al31C—Ru4A | 132.4 (8) |
| Al28$^{xi}$—Al14—Ru7 | 57.677 (13) | Al31A—Al31C—Ru4A | 78.5 (5) |
| Al28$^{xiv}$—Al14—Ru7 | 120.55 (3) | Al31B$^{vii}$—Al31C—Ru4A | 64.4 (4) |
| Al30A$^{ii}$—Al14—Ru7 | 115.22 (9) | Al32B$^{xix}$—Al31C—Ru4A | 142.0 (7) |
| Al30A$^{i}$—Al14—Ru7 | 55.52 (2) | Ru4B—Al31C—Ru4A | 3.9 (3) |
| Ru1—Al14—Ru7 | 110.100 (17) | Ru5A$^{xv}$—Al31C—Ru4A | 151.3 (6) |
| Ru7$^{vii}$—Al14—Ru7 | 104.15 (2) | Ru5B$^{xv}$—Al31C—Ru4A | 153.1 (6) |
| Ru3—Al15—Ru4A | 161.17 (5) | Al31B—Al31C—Al29B$^{viii}$ | 114.2 (11) |
| Ru3—Al15—Si18$^{viii}$ | 133.53 (3) | Al32A—Al31C—Al29B$^{viii}$ | 62.0 (7) |
| Ru4A—Al15—Si18$^{viii}$ | 60.00 (3) | Al32B—Al31C—Al29B$^{viii}$ | 79.7 (6) |
| Ru3—Al15—Si18$^{ix}$ | 133.53 (3) | Al31A—Al31C—Al29B$^{viii}$ | 120.6 (7) |
| Ru4A—Al15—Si18$^{ix}$ | 60.00 (3) | Al31B$^{vii}$—Al31C—Al29B$^{viii}$ | 99.0 (6) |
| Si18$^{viii}$—Al15—Si18$^{ix}$ | 66.95 (3) | Al32B$^{xix}$—Al31C—Al29B$^{viii}$ | 86.6 (5) |
| Ru3—Al15—Ru4B | 159.3 (2) | Ru4B—Al31C—Al29B$^{viii}$ | 60.3 (4) |
| Ru4A—Al15—Ru4B | 1.90 (19) | Ru5A$^{xv}$—Al31C—Al29B$^{viii}$ | 148.5 (6) |
| Si18$^{viii}$—Al15—Ru4B | 61.48 (16) | Ru5B$^{xv}$—Al31C—Al29B$^{viii}$ | 146.4 (6) |
| Si18$^{ix}$—Al15—Ru4B | 61.48 (16) | Ru4A—Al31C—Al29B$^{viii}$ | 60.1 (3) |
| Ru3—Al15—Al27$^{vii}$ | 114.21 (2) | Al31B—Al31C—Al31C$^{vii}$ | 25.5 (10) |
| Ru4A—Al15—Al27$^{vii}$ | 57.01 (2) | Al32A—Al31C—Al31C$^{vii}$ | 150.9 (7) |
| Si18$^{viii}$—Al15—Al27$^{vii}$ | 111.82 (3) | Al32B—Al31C—Al31C$^{vii}$ | 152.9 (5) |
| Si18$^{ix}$—Al15—Al27$^{vii}$ | 61.257 (17) | Al31A—Al31C—Al31C$^{vii}$ | 31.3 (4) |
| Ru4B—Al15—Al27$^{vii}$ | 56.29 (8) | Al31B$^{vii}$—Al31C—Al31C$^{vii}$ | 9.9 (4) |
| Ru3—Al15—Al27 | 114.21 (2) | Al32B$^{xix}$—Al31C—Al31C$^{vii}$ | 147.3 (3) |
| Ru4A—Al15—Al27 | 57.01 (2) | Ru4B—Al31C—Al31C$^{vii}$ | 53.3 (5) |

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| Si18$^{viii}$—Al15—Al27 | 61.258 (17) | Ru5A$^{xv}$—Al31C—Al31C$^{vii}$ | 111.0 (4) |
| Si18$^{ix}$—Al15—Al27 | 111.82 (3) | Ru5B$^{xv}$—Al31C—Al31C$^{vii}$ | 114.0 (4) |
| Ru4B—Al15—Al27 | 56.29 (8) | Ru4A—Al31C—Al31C$^{vii}$ | 56.9 (4) |
| Al27$^{vii}$—Al15—Al27 | 101.23 (3) | Al29B$^{viii}$—Al31C—Al31C$^{vii}$ | 89.3 (4) |
| Ru3—Al15—Al21 | 57.760 (15) | Al32B—Al32A—Al31C | 112.8 (8) |
| Ru4A—Al15—Al21 | 122.019 (17) | Al32B—Al32A—Al32B$^{xix}$ | 2.4 (5) |
| Si18$^{viii}$—Al15—Al21 | 82.302 (16) | Al31C—Al32A—Al32B$^{xix}$ | 114.9 (8) |
| Si18$^{ix}$—Al15—Al21 | 142.66 (3) | Al32B—Al32A—Al31B | 113.5 (4) |
| Ru4B—Al15—Al21 | 121.78 (3) | Al31C—Al32A—Al31B | 1.8 (8) |
| Al27$^{vii}$—Al15—Al21 | 155.18 (4) | Al32B$^{xix}$—Al32A—Al31B | 115.5 (2) |
| Al27—Al15—Al21 | 66.782 (15) | Al32B—Al32A—Al29B$^{viii}$ | 111.2 (3) |
| Ru3—Al15—Al21$^{vii}$ | 57.759 (15) | Al31C—Al32A—Al29B$^{viii}$ | 96.8 (7) |
| Ru4A—Al15—Al21$^{vii}$ | 122.019 (17) | Al32B$^{xix}$—Al32A—Al29B$^{viii}$ | 111.7 (2) |
| Si18$^{viii}$—Al15—Al21$^{vii}$ | 142.66 (3) | Al31B—Al32A—Al29B$^{viii}$ | 95.1 (2) |
| Si18$^{ix}$—Al15—Al21$^{vii}$ | 82.302 (16) | Al32B—Al32A—Al31A | 114.0 (3) |
| Ru4B—Al15—Al21$^{vii}$ | 121.78 (3) | Al31C—Al32A—Al31A | 2.7 (7) |
| Al27$^{vii}$—Al15—Al21$^{vii}$ | 66.782 (15) | Al32B$^{xix}$—Al32A—Al31A | 115.96 (16) |
| Al27—Al15—Al21$^{vii}$ | 155.18 (4) | Al31B—Al32A—Al31A | 4.16 (18) |
| Al21—Al15—Al21$^{vii}$ | 114.74 (3) | Al29B$^{viii}$—Al32A—Al31A | 98.51 (15) |
| Ru3—Al15—Al13 | 107.37 (3) | Al32B—Al32A—Al29A$^{viii}$ | 112.6 (3) |
| Ru4A—Al15—Al13 | 53.79 (3) | Al31C—Al32A—Al29A$^{viii}$ | 98.7 (7) |
| Si18$^{viii}$—Al15—Al13 | 104.09 (3) | Al32B$^{xix}$—Al32A—Al29A$^{viii}$ | 112.93 (15) |
| Si18$^{ix}$—Al15—Al13 | 104.09 (3) | Al31B—Al32A—Al29A$^{viii}$ | 96.98 (19) |
| Ru4B—Al15—Al13 | 51.9 (2) | Al29B$^{viii}$—Al32A—Al29A$^{viii}$ | 3.24 (15) |
| Al27$^{vii}$—Al15—Al13 | 54.228 (18) | Al31A—Al32A—Al29A$^{viii}$ | 100.31 (5) |
| Al27—Al15—Al13 | 54.228 (18) | Al32B—Al32A—Al32A$^{xix}$ | 1.5 (3) |
| Al21—Al15—Al13 | 103.53 (2) | Al31C—Al32A—Al32A$^{xix}$ | 114.2 (7) |
| Al21$^{vii}$—Al15—Al13 | 103.53 (2) | Al32B$^{xix}$—Al32A—Al32A$^{xix}$ | 0.82 (16) |
| Si17$^{xv}$—Si16—Ru6$^{vii}$ | 111.935 (18) | Al31B—Al32A—Al32A$^{xix}$ | 114.81 (19) |
| Si17$^{xv}$—Si16—Ru2$^{ix}$ | 112.514 (19) | Al29B$^{viii}$—Al32A—Al32A$^{xix}$ | 111.50 (14) |
| Ru6$^{vii}$—Si16—Ru2$^{ix}$ | 124.595 (17) | Al31A—Al32A—Al32A$^{xix}$ | 115.28 (5) |
| Si17$^{xv}$—Si16—Al20 | 138.74 (2) | Al29A$^{viii}$—Al32A—Al32A$^{xix}$ | 112.81 (5) |
| Ru6$^{vii}$—Si16—Al20 | 62.558 (15) | Al32B—Al32A—Ru5B$^{xx}$ | 62.4 (3) |
| Ru2$^{ix}$—Si16—Al20 | 62.335 (15) | Al31C—Al32A—Ru5B$^{xx}$ | 143.9 (7) |
| Si17$^{xv}$—Si16—Al12$^{ix}$ | 62.396 (19) | Al32B$^{xix}$—Al32A—Ru5B$^{xx}$ | 61.60 (19) |
| Ru6$^{vii}$—Si16—Al12$^{ix}$ | 119.15 (2) | Al31B—Al32A—Ru5B$^{xx}$ | 142.5 (2) |
| Ru2$^{ix}$—Si16—Al12$^{ix}$ | 59.702 (15) | Al29B$^{viii}$—Al32A—Ru5B$^{xx}$ | 58.16 (18) |
| Al20—Si16—Al12$^{ix}$ | 84.14 (2) | Al31A—Al32A—Ru5B$^{xx}$ | 146.61 (11) |
| Si17$^{xv}$—Si16—Al26$^{vii}$ | 111.74 (2) | Al29A$^{viii}$—Al32A—Ru5B$^{xx}$ | 57.75 (13) |
| Ru6$^{vii}$—Si16—Al26$^{vii}$ | 64.944 (14) | Al32A$^{xix}$—Al32A—Ru5B$^{xx}$ | 61.87 (11) |
| Ru2$^{ix}$—Si16—Al26$^{vii}$ | 123.088 (19) | Al32B—Al32A—Al27 | 140.0 (3) |
| Al20—Si16—Al26$^{vii}$ | 102.37 (2) | Al31C—Al32A—Al27 | 94.7 (7) |
| Al12$^{ix}$—Si16—Al26$^{vii}$ | 173.49 (2) | Al32B$^{xix}$—Al32A—Al27 | 137.76 (16) |
| Si17$^{xv}$—Si16—Al21$^{xvi}$ | 62.572 (17) | Al31B—Al32A—Al27 | 95.01 (18) |
| Ru6$^{vii}$—Si16—Al21$^{xvi}$ | 114.263 (19) | Al29B$^{viii}$—Al32A—Al27 | 92.69 (15) |
| Ru2$^{ix}$—Si16—Al21$^{xvi}$ | 114.665 (18) | Al31A—Al32A—Al27 | 92.49 (4) |
| Al20—Si16—Al21$^{xvi}$ | 158.69 (2) | Al29A$^{viii}$—Al32A—Al27 | 89.91 (6) |
| Al12$^{ix}$—Si16—Al21$^{xvi}$ | 113.27 (2) | Al32A$^{xix}$—Al32A—Al27 | 138.53 (5) |

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| Al26$^{vii}$—Si16—Al21$^{xvi}$ | 60.348 (17) | Ru5B$^{xx}$—Al32A—Al27 | 110.71 (8) |
| Si17$^{xv}$—Si16—Al28 | 110.33 (2) | Al32B—Al32A—Ru4B | 160.5 (5) |
| Ru6$^{vii}$—Si16—Al28 | 128.66 (2) | Al31C—Al32A—Ru4B | 56.6 (8) |
| Ru2$^{ix}$—Si16—Al28 | 58.969 (15) | Al32B$^{xix}$—Al32A—Ru4B | 162.6 (4) |
| Al20—Si16—Al28 | 101.00 (2) | Al31B—Al32A—Ru4B | 55.5 (4) |
| Al12$^{ix}$—Si16—Al28 | 105.54 (2) | Al29B$^{viii}$—Al32A—Ru4B | 58.5 (2) |
| Al26$^{vii}$—Si16—Al28 | 73.278 (18) | Al31A—Al32A—Ru4B | 56.4 (3) |
| Al21$^{xvi}$—Si16—Al28 | 63.524 (17) | Al29A$^{viii}$—Al32A—Ru4B | 58.12 (17) |
| Si17$^{xv}$—Si16—Al25 | 62.967 (17) | Al32A$^{xix}$—Al32A—Ru4B | 161.9 (3) |
| Ru6$^{vii}$—Si16—Al25 | 59.025 (13) | Ru5B$^{xx}$—Al32A—Ru4B | 114.9 (2) |
| Ru2$^{ix}$—Si16—Al25 | 118.817 (19) | Al27—Al32A—Ru4B | 59.5 (3) |
| Al20—Si16—Al25 | 83.338 (19) | Al32B—Al32A—Ru5A$^{xv}$ | 62.3 (3) |
| Al12$^{ix}$—Si16—Al25 | 68.317 (19) | Al31C—Al32A—Ru5A$^{xv}$ | 63.0 (7) |
| Al26$^{vii}$—Si16—Al25 | 112.27 (2) | Al32B$^{xix}$—Al32A—Ru5A$^{xv}$ | 63.20 (16) |
| Al21$^{xvi}$—Si16—Al25 | 113.86 (2) | Al31B—Al32A—Ru5A$^{xv}$ | 64.5 (2) |
| Al28—Si16—Al25 | 172.26 (2) | Al29B$^{viii}$—Al32A—Ru5A$^{xv}$ | 148.96 (17) |
| Ru1$^{ix}$—Si17—Ru5B$^{vii}$ | 122.40 (13) | Al31A—Al32A—Ru5A$^{xv}$ | 62.40 (7) |
| Ru1$^{ix}$—Si17—Si16$^{vi}$ | 111.692 (19) | Al29A$^{viii}$—Al32A—Ru5A$^{xv}$ | 152.17 (8) |
| Ru5B$^{vii}$—Si17—Si16$^{vi}$ | 113.65 (11) | Al32A$^{xix}$—Al32A—Ru5A$^{xv}$ | 62.89 (6) |
| Ru1$^{ix}$—Si17—Ru5A$^{vii}$ | 125.02 (6) | Ru5B$^{xx}$—Al32A—Ru5A$^{xv}$ | 124.72 (10) |
| Ru5B$^{vii}$—Si17—Ru5A$^{vii}$ | 2.76 (11) | Al27—Al32A—Ru5A$^{xv}$ | 111.33 (4) |
| Si16$^{vi}$—Si17—Ru5A$^{vii}$ | 112.18 (4) | Ru4B—Al32A—Ru5A$^{xv}$ | 116.7 (3) |
| Ru1$^{ix}$—Si17—Al29A | 62.27 (8) | Al32B$^{xix}$—Al32B—Al32A | 175.0 (10) |
| Ru5B$^{vii}$—Si17—Al29A | 60.21 (15) | Al32B$^{xix}$—Al32B—Al31C | 150.2 (10) |
| Si16$^{vi}$—Si17—Al29A | 140.22 (10) | Al32A—Al32B—Al31C | 34.0 (5) |
| Ru5A$^{vii}$—Si17—Al29A | 62.89 (9) | Al32B$^{xix}$—Al32B—Al32A$^{xix}$ | 2.7 (5) |
| Ru1$^{ix}$—Si17—Al23$^{vii}$ | 125.87 (2) | Al32A—Al32B—Al32A$^{xix}$ | 177.6 (5) |
| Ru5B$^{vii}$—Si17—Al23$^{vii}$ | 66.12 (10) | Al31C—Al32B—Al32A$^{xix}$ | 148.0 (6) |
| Si16$^{vi}$—Si17—Al23$^{vii}$ | 109.97 (2) | Al32B$^{xix}$—Al32B—Al31C$^{xix}$ | 19.6 (7) |
| Ru5A$^{vii}$—Si17—Al23$^{vii}$ | 64.14 (5) | Al32A—Al32B—Al31C$^{xix}$ | 156.1 (5) |
| Al29A—Si17—Al23$^{vii}$ | 102.62 (5) | Al31C—Al32B—Al31C$^{xix}$ | 169.8 (3) |
| Ru1$^{ix}$—Si17—Al12$^{xii}$ | 59.105 (16) | Al32A$^{xix}$—Al32B—Al31C$^{xix}$ | 21.8 (4) |
| Ru5B$^{vii}$—Si17—Al12$^{xii}$ | 118.91 (10) | Al32B$^{xix}$—Al32B—Al31B | 139.3 (8) |
| Si16$^{vi}$—Si17—Al12$^{xii}$ | 61.419 (18) | Al32A—Al32B—Al31B | 45.0 (3) |
| Ru5A$^{vii}$—Si17—Al12$^{xii}$ | 120.58 (5) | Al31C—Al32B—Al31B | 11.1 (5) |
| Al29A—Si17—Al12$^{xii}$ | 86.41 (5) | Al32A$^{xix}$—Al32B—Al31B | 137.0 (3) |
| Al23$^{vii}$—Si17—Al12$^{xii}$ | 170.93 (2) | Al31C$^{xix}$—Al32B—Al31B | 158.9 (4) |
| Ru1$^{ix}$—Si17—Al21$^{vii}$ | 115.734 (19) | Al32B$^{xix}$—Al32B—Ru5B$^{xv}$ | 80.7 (6) |
| Ru5B$^{vii}$—Si17—Al21$^{vii}$ | 116.11 (12) | Al32A—Al32B—Ru5B$^{xv}$ | 101.0 (3) |
| Si16$^{vi}$—Si17—Al21$^{vii}$ | 61.723 (16) | Al31C—Al32B—Ru5B$^{xv}$ | 75.2 (5) |
| Ru5A$^{vii}$—Si17—Al21$^{vii}$ | 113.40 (6) | Al32A$^{xix}$—Al32B—Ru5B$^{xv}$ | 79.8 (2) |
| Al29A—Si17—Al21$^{vii}$ | 158.05 (10) | Al31C$^{xix}$—Al32B—Ru5B$^{xv}$ | 96.6 (4) |
| Al23$^{vii}$—Si17—Al21$^{vii}$ | 59.590 (16) | Al31B—Al32B—Ru5B$^{xv}$ | 68.1 (2) |
| Al12$^{xii}$—Si17—Al21$^{vii}$ | 111.82 (2) | Al32B$^{xix}$—Al32B—Ru5B$^{xx}$ | 80.2 (6) |
| Ru1$^{ix}$—Si17—Al30A | 60.19 (7) | Al32A—Al32B—Ru5B$^{xx}$ | 98.1 (4) |
| Ru5B$^{vii}$—Si17—Al30A | 130.58 (10) | Al31C—Al32B—Ru5B$^{xx}$ | 122.9 (5) |
| Si16$^{vi}$—Si17—Al30A | 107.71 (3) | Al32A$^{xix}$—Al32B—Ru5B$^{xx}$ | 81.0 (2) |
| Ru5A$^{vii}$—Si17—Al30A | 130.32 (5) | Al31C$^{xix}$—Al32B—Ru5B$^{xx}$ | 64.7 (4) |

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| Al29A—Si17—Al30A | 102.02 (13) | Al31B—Al32B—Ru5B$^{xx}$ | 128.6 (3) |
| Al23$^{vii}$—Si17—Al30A | 75.34 (7) | Ru5B$^{xv}$—Al32B—Ru5B$^{xx}$ | 160.8 (2) |
| Al12$^{xii}$—Si17—Al30A | 103.87 (6) | Al32B$^{xix}$—Al32B—Ru5A$^{xv}$ | 83.6 (6) |
| Al21$^{vii}$—Si17—Al30A | 62.80 (5) | Al32A—Al32B—Ru5A$^{xv}$ | 98.3 (3) |
| Ru1$^{ix}$—Si17—Al29B | 67.3 (2) | Al31C—Al32B—Ru5A$^{xv}$ | 71.9 (5) |
| Ru5B$^{vii}$—Si17—Al29B | 55.8 (2) | Al32A$^{xix}$—Al32B—Ru5A$^{xv}$ | 82.59 (19) |
| Si16$^{vi}$—Si17—Al29B | 134.5 (2) | Al31C$^{xix}$—Al32B—Ru5A$^{xv}$ | 99.8 (4) |
| Ru5A$^{vii}$—Si17—Al29B | 58.5 (2) | Al31B—Al32B—Ru5A$^{xv}$ | 64.6 (2) |
| Al29A—Si17—Al29B | 7.30 (18) | Ru5B$^{xv}$—Al32B—Ru5A$^{xv}$ | 3.53 (12) |
| Al23$^{vii}$—Si17—Al29B | 104.21 (11) | Ru5B$^{xx}$—Al32B—Ru5A$^{xv}$ | 163.6 (3) |
| Al12$^{xii}$—Si17—Al29B | 84.64 (11) | Al32B$^{xix}$—Al32B—Ru5A$^{xx}$ | 77.5 (6) |
| Al21$^{vii}$—Si17—Al29B | 162.70 (15) | Al32A—Al32B—Ru5A$^{xx}$ | 100.6 (3) |
| Al30A—Si17—Al29B | 109.3 (3) | Al31C—Al32B—Ru5A$^{xx}$ | 126.1 (5) |
| Ru1$^{ix}$—Si17—Al25$^{vi}$ | 117.214 (19) | Al32A$^{xix}$—Al32B—Ru5A$^{xx}$ | 78.50 (18) |
| Ru5B$^{vii}$—Si17—Al25$^{vi}$ | 59.29 (9) | Al31C$^{xix}$—Al32B—Ru5A$^{xx}$ | 61.7 (3) |
| Si16$^{vi}$—Si17—Al25$^{vi}$ | 63.594 (17) | Al31B—Al32B—Ru5A$^{xx}$ | 131.9 (3) |
| Ru5A$^{vii}$—Si17—Al25$^{vi}$ | 59.47 (3) | Ru5B$^{xv}$—Al32B—Ru5A$^{xx}$ | 158.1 (2) |
| Al29A—Si17—Al25$^{vi}$ | 83.82 (13) | Ru5B$^{xx}$—Al32B—Ru5A$^{xx}$ | 3.31 (12) |
| Al23$^{vii}$—Si17—Al25$^{vi}$ | 111.48 (2) | Ru5A$^{xv}$—Al32B—Ru5A$^{xx}$ | 161.1 (2) |
| Al12$^{xii}$—Si17—Al25$^{vi}$ | 68.218 (19) | Al32B$^{xix}$—Al32B—Al29B$^{viii}$ | 130.1 (7) |
| Al21$^{vii}$—Si17—Al25$^{vi}$ | 113.69 (2) | Al32A—Al32B—Al29B$^{viii}$ | 50.8 (3) |
| Al30A—Si17—Al25$^{vi}$ | 170.09 (4) | Al31C—Al32B—Al29B$^{viii}$ | 66.8 (5) |
| Al29B—Si17—Al25$^{vi}$ | 76.6 (3) | Al32A$^{xix}$—Al32B—Al29B$^{viii}$ | 129.7 (3) |
| Al24$^{vii}$—Si18—Ru4A$^{ii}$ | 116.89 (5) | Al31C$^{xix}$—Al32B—Al29B$^{viii}$ | 119.7 (4) |
| Al24$^{vii}$—Si18—Ru2$^{ix}$ | 115.631 (19) | Al31B—Al32B—Al29B$^{viii}$ | 72.6 (2) |
| Ru4A$^{ii}$—Si18—Ru2$^{ix}$ | 111.39 (3) | Ru5B$^{xv}$—Al32B—Al29B$^{viii}$ | 140.5 (3) |
| Al24$^{vii}$—Si18—Ru7$^{vii}$ | 65.391 (15) | Ru5B$^{xx}$—Al32B—Al29B$^{viii}$ | 56.3 (2) |
| Ru4A$^{ii}$—Si18—Ru7$^{vii}$ | 117.981 (18) | Ru5A$^{xv}$—Al32B—Al29B$^{viii}$ | 136.9 (3) |
| Ru2$^{ix}$—Si18—Ru7$^{vii}$ | 122.264 (17) | Ru5A$^{xx}$—Al32B—Al29B$^{viii}$ | 59.51 (19) |
| Al24$^{vii}$—Si18—Al20 | 62.973 (18) | Al32B$^{xix}$—Al32B—Al22$^{xx}$ | 99.0 (7) |
| Ru4A$^{ii}$—Si18—Al20 | 111.35 (3) | Al32A—Al32B—Al22$^{xx}$ | 76.1 (3) |
| Ru2$^{ix}$—Si18—Al20 | 61.341 (15) | Al31C—Al32B—Al22$^{xx}$ | 108.2 (5) |
| Ru7$^{vii}$—Si18—Al20 | 119.95 (2) | Al32A$^{xix}$—Al32B—Al22$^{xx}$ | 101.6 (2) |
| Al24$^{vii}$—Si18—Al29A | 64.36 (3) | Al31C$^{xix}$—Al32B—Al22$^{xx}$ | 81.1 (4) |
| Ru4A$^{ii}$—Si18—Al29A | 60.69 (9) | Al31B—Al32B—Al22$^{xx}$ | 118.9 (2) |
| Ru2$^{ix}$—Si18—Al29A | 111.40 (10) | Ru5B$^{xv}$—Al32B—Al22$^{xx}$ | 120.6 (2) |
| Ru7$^{vii}$—Si18—Al29A | 117.65 (6) | Ru5B$^{xx}$—Al32B—Al22$^{xx}$ | 62.83 (14) |
| Al20—Si18—Al29A | 61.85 (11) | Ru5A$^{xv}$—Al32B—Al22$^{xx}$ | 122.35 (18) |
| Al24$^{vii}$—Si18—Al15$^{ii}$ | 153.95 (2) | Ru5A$^{xx}$—Al32B—Al22$^{xx}$ | 61.65 (11) |
| Ru4A$^{ii}$—Si18—Al15$^{ii}$ | 57.69 (5) | Al29B$^{viii}$—Al32B—Al22$^{xx}$ | 82.81 (18) |

Symmetry codes: (i) $-x+1/2, y-1/2, z+1/2$; (ii) $-x+1/2, -y+1, z+1/2$; (iii) $x-1/2, y, -z+3/2$; (iv) $x+1/2, y, -z+3/2$; (v) $x+1/2, -y+1/2, -z+1/2$; (vi) $x+1/2, y, -z+1/2$; (vii) $x, -y+1/2, z$; (viii) $-x+1/2, y-1/2, z-1/2$; (ix) $-x+1/2, -y+1, z-1/2$; (x) $-x+1/2, -y, z+1/2$; (xi) $-x, y-1/2, -z+1$; (xii) $-x+1, -y+1, -z+1$; (xiii) $-x+1, y-1/2, -z+1$; (xiv) $-x, -y+1, -z+1$; (xv) $x-1/2, y, -z+1/2$; (xvi) $x-1/2, -y+1/2, -z+1/2$; (xvii) $-x+1/2, y+1/2, z+1/2$; (xviii) $x, -y+3/2, z$; (xix) $-x, -y, -z$; (xx) $-x+1/2, -y, z-1/2$; (xxi) $-x+1/2, y+1/2, z-1/2$; (xxii) $-x, y+1/2, -z+1$.

## Trialuminium ruthenium disilicon (IV)

*Crystal data*

~$Ru(Al_{0.57}Si_{0.43})_5$
$M_r$ = 238.38
Tetragonal, *I*4/*mcm*
*a* = 6.20079 (8) Å
*c* = 9.6937 (2) Å
*V* = 372.72 (1) Å$^3$
*Z* = 4
*F*(000) = 440.99
$D_x$ = 4.248 Mg m$^{-3}$
Mo *Kα* radiation, *λ* = 0.71073 Å
Cell parameters from 5393 reflections
*θ* = 4.2–38.2°
*μ* = 5.32 mm$^{-1}$
*T* = 297 K
Irregular, metallic light silver
0.05 × 0.03 × 0.02 mm

*Data collection*

XtaLAB Synergy R, HyPix diffractometer
Radiation source: micro-focus sealed X-ray tube, Mova (Mo) X-ray Source
Mirror monochromator
Detector resolution: 10.0000 pixels mm$^{-1}$
*ω* scans
Absorption correction: gaussian (CrysAlisPro; Matsumoto *et al.*, 2021)
$T_{min}$ = 0.833, $T_{max}$ = 0.906
8063 measured reflections
295 independent reflections
279 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.029
$\theta_{max}$ = 37.9°, $\theta_{min}$ = 4.2°
*h* = −10→10
*k* = −10→10
*l* = −16→16

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.009
$wR(F^2)$ = 0.021
*S* = 1.21
295 reflections
13 parameters
2 restraints
Primary atom site location: dual
$w = 1/[\sigma^2(F_o^2) + (0.0084P)^2 + 0.2167P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} < 0.001$
$\Delta\rho_{max}$ = 0.44 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.42 e Å$^{-3}$
Extinction correction: SHELXL-2019/3 (Sheldrick, 2015b), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$
Extinction coefficient: 0.0037 (3)

*Special details*

**Geometry**. All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å$^2$)*

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| Ru1 | 0.000000 | 0.000000 | 0.250000 | 0.00545 (5) | |
| Al2 | 0.000000 | 0.000000 | 0.000000 | 0.01321 (14) | |
| Si3 | 0.14854 (4) | 0.64854 (4) | 0.14385 (4) | 0.01122 (8) | 0.542 (6) |
| Al3 | 0.14854 (4) | 0.64854 (4) | 0.14385 (4) | 0.01122 (8) | 0.458 (6) |

*Atomic displacement parameters (Å$^2$)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ru1 | 0.00611 (6) | 0.00611 (6) | 0.00414 (7) | 0.000 | 0.000 | 0.000 |
| Al2 | 0.0174 (2) | 0.0174 (2) | 0.0048 (3) | 0.000 | 0.000 | 0.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Si3 | 0.01030 (10) | 0.01030 (10) | 0.01304 (15) | 0.00364 (11) | 0.00111 (8) | 0.00111 (8) |
| Al3 | 0.01030 (10) | 0.01030 (10) | 0.01304 (15) | 0.00364 (11) | 0.00111 (8) | 0.00111 (8) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ru1—Al2$^{i}$ | 2.4234 (1) | Ru1—Si3$^{ix}$ | 2.5800 (2) |
| Ru1—Al2 | 2.4234 (1) | Al2—Si3$^{x}$ | 2.7463 (2) |
| Ru1—Si3$^{ii}$ | 2.5800 (2) | Al2—Si3$^{vii}$ | 2.7463 (2) |
| Ru1—Si3$^{iii}$ | 2.5800 (2) | Al2—Si3$^{xi}$ | 2.7463 (2) |
| Ru1—Si3$^{iv}$ | 2.5800 (2) | Al2—Si3$^{ix}$ | 2.7463 (2) |
| Ru1—Si3$^{v}$ | 2.5800 (2) | Al2—Si3$^{xii}$ | 2.7463 (2) |
| Ru1—Si3$^{vi}$ | 2.5800 (2) | Al2—Si3$^{ii}$ | 2.7463 (2) |
| Ru1—Si3$^{vii}$ | 2.5800 (2) | Al2—Si3$^{xiii}$ | 2.7463 (2) |
| Ru1—Si3$^{viii}$ | 2.5800 (2) | Al2—Si3$^{iv}$ | 2.7463 (2) |
| | | | |
| Al2$^{i}$—Ru1—Al2 | 180.0 | Si3$^{vii}$—Al2—Si3$^{xii}$ | 61.029 (13) |
| Al2$^{i}$—Ru1—Si3$^{ii}$ | 113.504 (7) | Si3$^{xi}$—Al2—Si3$^{xii}$ | 75.060 (6) |
| Al2—Ru1—Si3$^{ii}$ | 66.496 (7) | Si3$^{ix}$—Al2—Si3$^{xii}$ | 104.940 (6) |
| Al2$^{i}$—Ru1—Si3$^{iii}$ | 66.496 (7) | Ru1$^{xiv}$—Al2—Si3$^{ii}$ | 120.514 (7) |
| Al2—Ru1—Si3$^{iii}$ | 113.504 (7) | Ru1—Al2—Si3$^{ii}$ | 59.486 (7) |
| Si3$^{ii}$—Ru1—Si3$^{iii}$ | 139.656 (16) | Si3$^{x}$—Al2—Si3$^{ii}$ | 61.029 (13) |
| Al2$^{i}$—Ru1—Si3$^{iv}$ | 113.504 (7) | Si3$^{vii}$—Al2—Si3$^{ii}$ | 118.971 (13) |
| Al2—Ru1—Si3$^{iv}$ | 66.496 (7) | Si3$^{xi}$—Al2—Si3$^{ii}$ | 104.940 (6) |
| Si3$^{ii}$—Ru1—Si3$^{iv}$ | 80.848 (5) | Si3$^{ix}$—Al2—Si3$^{ii}$ | 75.060 (6) |
| Si3$^{iii}$—Ru1—Si3$^{iv}$ | 138.167 (15) | Si3$^{xii}$—Al2—Si3$^{ii}$ | 180.000 (17) |
| Al2$^{i}$—Ru1—Si3$^{v}$ | 66.496 (7) | Ru1$^{xiv}$—Al2—Si3$^{xiii}$ | 59.486 (7) |
| Al2—Ru1—Si3$^{v}$ | 113.504 (7) | Ru1—Al2—Si3$^{xiii}$ | 120.514 (7) |
| Si3$^{ii}$—Ru1—Si3$^{v}$ | 138.167 (15) | Si3$^{x}$—Al2—Si3$^{xiii}$ | 75.060 (6) |
| Si3$^{iii}$—Ru1—Si3$^{v}$ | 80.848 (5) | Si3$^{vii}$—Al2—Si3$^{xiii}$ | 104.940 (6) |
| Si3$^{iv}$—Ru1—Si3$^{v}$ | 63.637 (14) | Si3$^{xi}$—Al2—Si3$^{xiii}$ | 118.971 (13) |
| Al2$^{i}$—Ru1—Si3$^{vi}$ | 66.496 (7) | Si3$^{ix}$—Al2—Si3$^{xiii}$ | 61.029 (13) |
| Al2—Ru1—Si3$^{vi}$ | 113.504 (7) | Si3$^{xii}$—Al2—Si3$^{xiii}$ | 75.060 (6) |
| Si3$^{ii}$—Ru1—Si3$^{vi}$ | 63.637 (14) | Si3$^{ii}$—Al2—Si3$^{xiii}$ | 104.940 (6) |
| Si3$^{iii}$—Ru1—Si3$^{vi}$ | 132.991 (15) | Ru1$^{xiv}$—Al2—Si3$^{iv}$ | 120.514 (7) |
| Si3$^{iv}$—Ru1—Si3$^{vi}$ | 64.724 (16) | Ru1—Al2—Si3$^{iv}$ | 59.486 (7) |
| Si3$^{v}$—Ru1—Si3$^{vi}$ | 80.848 (5) | Si3$^{x}$—Al2—Si3$^{iv}$ | 104.940 (6) |
| Al2$^{i}$—Ru1—Si3$^{vii}$ | 113.504 (7) | Si3$^{vii}$—Al2—Si3$^{iv}$ | 75.060 (6) |
| Al2—Ru1—Si3$^{vii}$ | 66.496 (7) | Si3$^{xi}$—Al2—Si3$^{iv}$ | 61.029 (13) |
| Si3$^{ii}$—Ru1—Si3$^{vii}$ | 132.991 (15) | Si3$^{ix}$—Al2—Si3$^{iv}$ | 118.971 (13) |
| Si3$^{iii}$—Ru1—Si3$^{vii}$ | 63.637 (14) | Si3$^{xii}$—Al2—Si3$^{iv}$ | 104.940 (6) |
| Si3$^{iv}$—Ru1—Si3$^{vii}$ | 80.848 (5) | Si3$^{ii}$—Al2—Si3$^{iv}$ | 75.060 (6) |
| Si3$^{v}$—Ru1—Si3$^{vii}$ | 64.724 (16) | Si3$^{xiii}$—Al2—Si3$^{iv}$ | 180.000 (13) |
| Si3$^{vi}$—Ru1—Si3$^{vii}$ | 139.656 (16) | Ru1$^{xv}$—Al3—Ru1$^{v}$ | 116.363 (14) |
| Al2$^{i}$—Ru1—Si3$^{viii}$ | 66.496 (7) | Ru1$^{xv}$—Al3—Si3$^{ix}$ | 110.173 (8) |
| Al2—Ru1—Si3$^{viii}$ | 113.504 (7) | Ru1$^{v}$—Al3—Si3$^{ix}$ | 110.173 (8) |
| Si3$^{ii}$—Ru1—Si3$^{viii}$ | 64.724 (16) | Ru1$^{xv}$—Al3—Si3$^{xvi}$ | 58.182 (7) |
| Si3$^{iii}$—Ru1—Si3$^{viii}$ | 80.848 (5) | Ru1$^{v}$—Al3—Si3$^{xvi}$ | 58.182 (7) |
| Si3$^{iv}$—Ru1—Si3$^{viii}$ | 139.656 (16) | Si3$^{ix}$—Al3—Si3$^{xvi}$ | 130.850 (15) |

| | | | |
|---|---|---|---|
| Si3$^{v}$—Ru1—Si3$^{viii}$ | 132.991 (15) | Ru1$^{xv}$—Al3—Al2$^{xv}$ | 54.019 (3) |
| Si3$^{vi}$—Ru1—Si3$^{viii}$ | 80.848 (5) | Ru1$^{v}$—Al3—Al2$^{xv}$ | 140.272 (15) |
| Si3$^{vii}$—Ru1—Si3$^{viii}$ | 138.167 (15) | Si3$^{ix}$—Al3—Al2$^{xv}$ | 108.902 (7) |
| Al2$^{i}$—Ru1—Si3$^{ix}$ | 113.504 (7) | Si3$^{xvi}$—Al3—Al2$^{xv}$ | 99.916 (13) |
| Al2—Ru1—Si3$^{ix}$ | 66.496 (7) | Ru1$^{xv}$—Al3—Al2$^{xvii}$ | 140.272 (15) |
| Si3$^{ii}$—Ru1—Si3$^{ix}$ | 80.848 (5) | Ru1$^{v}$—Al3—Al2$^{xvii}$ | 54.019 (3) |
| Si3$^{iii}$—Ru1—Si3$^{ix}$ | 64.724 (16) | Si3$^{ix}$—Al3—Al2$^{xvii}$ | 108.902 (7) |
| Si3$^{iv}$—Ru1—Si3$^{ix}$ | 132.991 (15) | Si3$^{xvi}$—Al3—Al2$^{xvii}$ | 99.916 (13) |
| Si3$^{v}$—Ru1—Si3$^{ix}$ | 139.656 (16) | Al2$^{xv}$—Al3—Al2$^{xvii}$ | 105.930 (12) |
| Si3$^{vi}$—Ru1—Si3$^{ix}$ | 138.167 (15) | Ru1$^{xv}$—Al3—Si3$^{xviii}$ | 57.638 (8) |
| Si3$^{vii}$—Ru1—Si3$^{ix}$ | 80.848 (5) | Ru1$^{v}$—Al3—Si3$^{xviii}$ | 105.441 (17) |
| Si3$^{viii}$—Ru1—Si3$^{ix}$ | 63.637 (14) | Si3$^{ix}$—Al3—Si3$^{xviii}$ | 61.861 (8) |
| Ru1$^{xiv}$—Al2—Ru1 | 180.0 | Si3$^{xvi}$—Al3—Si3$^{xviii}$ | 75.218 (17) |
| Ru1$^{xiv}$—Al2—Si3$^{x}$ | 59.486 (7) | Al2$^{xv}$—Al3—Si3$^{xviii}$ | 98.895 (8) |
| Ru1—Al2—Si3$^{x}$ | 120.514 (7) | Al2$^{xvii}$—Al3—Si3$^{xviii}$ | 155.175 (11) |
| Ru1$^{xiv}$—Al2—Si3$^{vii}$ | 120.514 (7) | Ru1$^{xv}$—Al3—Si3$^{iii}$ | 105.441 (17) |
| Ru1—Al2—Si3$^{vii}$ | 59.486 (7) | Ru1$^{v}$—Al3—Si3$^{iii}$ | 57.638 (8) |
| Si3$^{x}$—Al2—Si3$^{vii}$ | 180.000 (13) | Si3$^{ix}$—Al3—Si3$^{iii}$ | 61.861 (8) |
| Ru1$^{xiv}$—Al2—Si3$^{xi}$ | 59.486 (7) | Si3$^{xvi}$—Al3—Si3$^{iii}$ | 75.218 (17) |
| Ru1—Al2—Si3$^{xi}$ | 120.514 (7) | Al2$^{xv}$—Al3—Si3$^{iii}$ | 155.175 (11) |
| Si3$^{x}$—Al2—Si3$^{xi}$ | 75.060 (6) | Al2$^{xvii}$—Al3—Si3$^{iii}$ | 98.895 (8) |
| Si3$^{vii}$—Al2—Si3$^{xi}$ | 104.940 (6) | Si3$^{xviii}$—Al3—Si3$^{iii}$ | 56.280 (15) |
| Ru1$^{xiv}$—Al2—Si3$^{ix}$ | 120.514 (7) | Ru1$^{xv}$—Al3—Si3$^{xix}$ | 113.504 (7) |
| Ru1—Al2—Si3$^{ix}$ | 59.486 (7) | Ru1$^{v}$—Al3—Si3$^{xix}$ | 113.504 (7) |
| Si3$^{x}$—Al2—Si3$^{ix}$ | 104.940 (6) | Si3$^{ix}$—Al3—Si3$^{xix}$ | 90.0 |
| Si3$^{vii}$—Al2—Si3$^{ix}$ | 75.060 (6) | Si3$^{xvi}$—Al3—Si3$^{xix}$ | 139.151 (15) |
| Si3$^{xi}$—Al2—Si3$^{ix}$ | 180.00 (2) | Al2$^{xv}$—Al3—Si3$^{xix}$ | 59.485 (7) |
| Ru1$^{xiv}$—Al2—Si3$^{xii}$ | 59.486 (7) | Al2$^{xvii}$—Al3—Si3$^{xix}$ | 59.485 (7) |
| Ru1—Al2—Si3$^{xii}$ | 120.514 (7) | Si3$^{xviii}$—Al3—Si3$^{xix}$ | 138.167 (13) |
| Si3$^{x}$—Al2—Si3$^{xii}$ | 118.971 (13) | Si3$^{iii}$—Al3—Si3$^{xix}$ | 138.167 (13) |

Symmetry codes: (i) −*x*, *y*, −*z*+1/2; (ii) *y*−1, −*x*, *z*; (iii) *y*−1/2, −*x*+1/2, −*z*+1/2; (iv) *x*, *y*−1, *z*; (v) −*x*+1/2, −*y*+1/2, −*z*+1/2; (vi) −*y*+1/2, *x*−1/2, −*z*+1/2; (vii) −*y*+1, *x*, *z*; (viii) *x*−1/2, *y*−1/2, −*z*+1/2; (ix) −*x*, −*y*+1, *z*; (x) *y*−1, −*x*, −*z*; (xi) *x*, *y*−1, −*z*; (xii) −*y*+1, *x*, −*z*; (xiii) −*x*, −*y*+1, −*z*; (xiv) −*x*, −*y*, −*z*; (xv) *x*, *y*+1, *z*; (xvi) −*x*+1/2, −*y*+3/2, −*z*+1/2; (xvii) −*x*+1/2, *y*+1/2, −*z*; (xviii) −*y*+1/2, *x*+1/2, −*z*+1/2; (xix) *x*, *y*, −*z*.

## Tetraaluminium diruthenium pentasilicon (V)

*Crystal data*

~$Ru_2(Al_{0.46}Si_{0.54})_9$
$M_r$ = 450.41
Orthorhombic, *Cmcm*
*a* = 8.63058 (14) Å
*b* = 8.79888 (15) Å
*c* = 17.4620 (3) Å
*V* = 1326.05 (4) Å$^3$
*Z* = 8
*F*(000) = 1664.17
$D_x$ = 4.512 Mg m$^{-3}$
Mo *Kα* radiation, *λ* = 0.71073 Å
Cell parameters from 11544 reflections
*θ* = 2.3–30.7°
*μ* = 5.88 mm$^{-1}$
*T* = 301 K
Irregular, metallic light silver
0.05 × 0.04 × 0.04 mm

*Data collection*

XtaLAB Synergy R, HyPix diffractometer
Radiation source: micro-focus sealed X-ray tube, Mova (Mo) X-ray Source
Mirror monochromator
Detector resolution: 10.0000 pixels mm$^{-1}$
$\omega$ scans
Absorption correction: gaussian (CrysAlisPro; Matsumoto *et al.*, 2021)
$T_{min}$ = 0.826, $T_{max}$ = 0.868
17672 measured reflections
1029 independent reflections
1001 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.016
$\theta_{max}$ = 30.8°, $\theta_{min}$ = 2.3°
$h$ = −12→11
$k$ = −11→11
$l$ = −22→24

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.011
$wR(F^2)$ = 0.027
$S$ = 1.31
1029 reflections
61 parameters
2 restraints
Primary atom site location: dual
$w = 1/[\sigma^2(F_o^2) + (0.0114P)^2 + 0.7123P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max}$ = 0.001
$\Delta\rho_{max}$ = 0.37 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.42 e Å$^{-3}$
Extinction correction: SHELXL-2019/3 (Sheldrick, 2015b), $Fc^*=kFc[1+0.001xFc^2\lambda^3/\sin(2\theta)]^{-1/4}$
Extinction coefficient: 0.00053 (3)

*Special details*

**Geometry**. All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å$^2$)*

| | $x$ | $y$ | $z$ | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| Ru1 | 0.25176 (2) | 0.12442 (2) | 0.11292 (2) | 0.00469 (5) | |
| Si2 | 0.000000 | 0.50890 (5) | 0.16887 (2) | 0.00820 (9) | |
| Si3 | 0.000000 | 0.28515 (5) | 0.56422 (2) | 0.00938 (9) | |
| Si4 | 0.000000 | 0.10304 (5) | 0.04648 (3) | 0.01097 (9) | |
| Si5 | 0.000000 | 0.23256 (5) | 0.17514 (2) | 0.0069 (2) | 0.65 (4) |
| Al5 | 0.000000 | 0.23256 (5) | 0.17514 (2) | 0.0069 (2) | 0.35 (4) |
| Al6 | 0.26445 (6) | 0.13651 (5) | 0.250000 | 0.01175 (12) | |
| Si7 | 0.35637 (4) | 0.38251 (3) | 0.17041 (2) | 0.00739 (13) | 0.63 (2) |
| Al7 | 0.35637 (4) | 0.38251 (3) | 0.17041 (2) | 0.00739 (13) | 0.37 (2) |
| Al8 | 0.18469 (5) | 0.37313 (3) | 0.04292 (2) | 0.01109 (9) | |

*Atomic displacement parameters (Å$^2$)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| Ru1 | 0.00473 (7) | 0.00517 (7) | 0.00417 (7) | 0.00013 (3) | −0.00034 (2) | 0.00002 (2) |
| Si2 | 0.00592 (18) | 0.00705 (19) | 0.0116 (2) | 0.000 | 0.000 | 0.00072 (14) |
| Si3 | 0.00535 (18) | 0.0126 (2) | 0.01020 (19) | 0.000 | 0.000 | −0.00283 (15) |
| Si4 | 0.00543 (19) | 0.0197 (2) | 0.00778 (19) | 0.000 | 0.000 | −0.00166 (15) |
| Si5 | 0.0065 (3) | 0.0070 (3) | 0.0073 (3) | 0.000 | 0.000 | −0.00015 (14) |
| Al5 | 0.0065 (3) | 0.0070 (3) | 0.0073 (3) | 0.000 | 0.000 | −0.00015 (14) |
| Al6 | 0.0146 (3) | 0.0162 (3) | 0.0045 (2) | 0.00041 (17) | 0.000 | 0.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Si7 | 0.0068 (2) | 0.00576 (18) | 0.00963 (19) | 0.00060 (10) | −0.00059 (11) | 0.00062 (9) |
| Al7 | 0.0068 (2) | 0.00576 (18) | 0.00963 (19) | 0.00060 (10) | −0.00059 (11) | 0.00062 (9) |
| Al8 | 0.0175 (2) | 0.00624 (17) | 0.00951 (17) | 0.00015 (11) | −0.00498 (14) | 0.00012 (10) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| Ru1—Al6 | 2.3986 (1) | Si3—Si7$^{x}$ | 2.6742 (5) |
| Ru1—Si3$^{i}$ | 2.4385 (2) | Si3—Si7$^{xi}$ | 2.6742 (5) |
| Ru1—Si4 | 2.4703 (2) | Si4—Si4$^{xii}$ | 2.4337 (9) |
| Ru1—Si7$^{ii}$ | 2.5317 (3) | Si4—Si5 | 2.5192 (6) |
| Ru1—Si2$^{iii}$ | 2.5647 (2) | Si4—Al8$^{xiii}$ | 2.8622 (5) |
| Ru1—Al8 | 2.5727 (3) | Si4—Al8 | 2.8622 (5) |
| Ru1—Al8$^{ii}$ | 2.5853 (3) | Si5—Si5$^{viii}$ | 2.6144 (8) |
| Ru1—Si5 | 2.6091 (2) | Si5—Al6$^{ix}$ | 2.7626 (5) |
| Ru1—Si7 | 2.6420 (3) | Si5—Al6 | 2.7626 (5) |
| Ru1—Al8$^{iv}$ | 2.7759 (4) | Al6—Si7$^{viii}$ | 2.6918 (5) |
| Si2—Si5 | 2.4339 (6) | Al6—Si7 | 2.6918 (5) |
| Si2—Si3$^{v}$ | 2.5736 (6) | Al6—Si7$^{ii}$ | 2.8309 (5) |
| Si2—Al6$^{vi}$ | 2.7204 (5) | Al6—Si7$^{xiv}$ | 2.8309 (5) |
| Si2—Al6$^{vii}$ | 2.7204 (5) | Si7—Si7$^{xv}$ | 2.4792 (7) |
| Si2—Si2$^{viii}$ | 2.8334 (8) | Si7—Al8 | 2.6755 (5) |
| Si3—Si4$^{viii}$ | 2.5108 (6) | Si7—Si7$^{viii}$ | 2.7796 (6) |
| Si3—Al8$^{ix}$ | 2.5768 (5) | Al8—Al8$^{xvi}$ | 2.6890 (6) |
| Si3—Al8$^{viii}$ | 2.5768 (5) | Al8—Al8$^{iv}$ | 2.8658 (7) |
| | | | |
| Al6—Ru1—Si3$^{i}$ | 107.063 (16) | Si4—Si5—Ru1$^{xiii}$ | 57.561 (8) |
| Al6—Ru1—Si4 | 120.811 (16) | Ru1—Si5—Ru1$^{xiii}$ | 112.774 (15) |
| Si3$^{i}$—Ru1—Si4 | 129.335 (13) | Si2—Si5—Si5$^{viii}$ | 92.579 (13) |
| Al6—Ru1—Si7$^{ii}$ | 70.025 (14) | Si4—Si5—Si5$^{viii}$ | 153.104 (14) |
| Si3$^{i}$—Ru1—Si7$^{ii}$ | 137.435 (12) | Ru1—Si5—Si5$^{viii}$ | 114.611 (8) |
| Si4—Ru1—Si7$^{ii}$ | 78.346 (13) | Ru1$^{xiii}$—Si5—Si5$^{viii}$ | 114.612 (8) |
| Al6—Ru1—Si2$^{iii}$ | 66.376 (15) | Si2—Si5—Al6$^{ix}$ | 109.080 (15) |
| Si3$^{i}$—Ru1—Si2$^{iii}$ | 61.852 (12) | Si4—Si5—Al6$^{ix}$ | 106.475 (13) |
| Si4—Ru1—Si2$^{iii}$ | 152.066 (14) | Ru1—Si5—Al6$^{ix}$ | 140.67 (2) |
| Si7$^{ii}$—Ru1—Si2$^{iii}$ | 79.843 (11) | Ru1$^{xiii}$—Si5—Al6$^{ix}$ | 52.949 (6) |
| Al6—Ru1—Al8 | 116.532 (14) | Si5$^{viii}$—Si5—Al6$^{ix}$ | 61.760 (9) |
| Si3$^{i}$—Ru1—Al8 | 75.784 (12) | Si2—Si5—Al6 | 109.080 (15) |
| Si4—Ru1—Al8 | 69.127 (14) | Si4—Si5—Al6 | 106.475 (13) |
| Si7$^{ii}$—Ru1—Al8 | 145.151 (12) | Ru1—Si5—Al6 | 52.948 (6) |
| Si2$^{iii}$—Ru1—Al8 | 134.919 (12) | Ru1$^{xiii}$—Si5—Al6 | 140.67 (2) |
| Al6—Ru1—Al8$^{ii}$ | 120.008 (14) | Si5$^{viii}$—Si5—Al6 | 61.760 (9) |
| Si3$^{i}$—Ru1—Al8$^{ii}$ | 85.859 (13) | Al6$^{ix}$—Si5—Al6 | 111.41 (2) |
| Si4—Ru1—Al8$^{ii}$ | 84.229 (14) | Ru1—Al6—Ru1$^{viii}$ | 172.70 (3) |
| Si7$^{ii}$—Ru1—Al8$^{ii}$ | 63.042 (11) | Ru1—Al6—Si7$^{viii}$ | 124.360 (19) |
| Si2$^{iii}$—Ru1—Al8$^{ii}$ | 70.363 (13) | Ru1$^{viii}$—Al6—Si7$^{viii}$ | 62.218 (9) |
| Al8—Ru1—Al8$^{ii}$ | 123.409 (15) | Ru1—Al6—Si7 | 62.216 (9) |
| Al6—Ru1—Si5 | 66.810 (15) | Ru1$^{viii}$—Al6—Si7 | 124.362 (19) |
| Si3$^{i}$—Ru1—Si5 | 139.280 (14) | Si7$^{viii}$—Al6—Si7 | 62.170 (17) |

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|---|---|---|---|
| Si4—Ru1—Si5 | 59.392 (12) | Ru1—Al6—Si2$^{xix}$ | 122.379 (19) |
| Si7$^{ii}$—Ru1—Si5 | 80.473 (12) | Ru1$^{viii}$—Al6—Si2$^{xix}$ | 59.741 (10) |
| Si2$^{iii}$—Ru1—Si5 | 132.966 (13) | Si7$^{viii}$—Al6—Si2$^{xix}$ | 80.955 (15) |
| Al8—Ru1—Si5 | 72.557 (13) | Si7—Al6—Si2$^{xix}$ | 112.37 (2) |
| Al8$^{ii}$—Ru1—Si5 | 133.275 (12) | Ru1—Al6—Si2$^{iii}$ | 59.741 (10) |
| Al6—Ru1—Si7 | 64.344 (14) | Ru1$^{viii}$—Al6—Si2$^{iii}$ | 122.378 (19) |
| Si3$^{i}$—Ru1—Si7 | 63.371 (12) | Si7$^{viii}$—Al6—Si2$^{iii}$ | 112.37 (2) |
| Si4—Ru1—Si7 | 122.988 (13) | Si7—Al6—Si2$^{iii}$ | 80.955 (15) |
| Si7$^{ii}$—Ru1—Si7 | 134.263 (14) | Si2$^{xix}$—Al6—Si2$^{iii}$ | 62.768 (19) |
| Si2$^{iii}$—Ru1—Si7 | 84.862 (11) | Ru1—Al6—Si5 | 60.241 (11) |
| Al8—Ru1—Si7 | 61.722 (10) | Ru1$^{viii}$—Al6—Si5 | 116.619 (19) |
| Al8$^{ii}$—Ru1—Si7 | 147.382 (11) | Si7$^{viii}$—Al6—Si5 | 103.993 (19) |
| Si5—Ru1—Si7 | 79.214 (11) | Si7—Al6—Si5 | 75.712 (14) |
| Al6—Ru1—Al8$^{iv}$ | 165.673 (16) | Si2$^{xix}$—Al6—Si5 | 171.91 (2) |
| Si3$^{i}$—Ru1—Al8$^{iv}$ | 58.803 (12) | Si2$^{iii}$—Al6—Si5 | 119.817 (12) |
| Si4—Ru1—Al8$^{iv}$ | 73.383 (12) | Ru1—Al6—Si5$^{viii}$ | 116.620 (19) |
| Si7$^{ii}$—Ru1—Al8$^{iv}$ | 117.911 (10) | Ru1$^{viii}$—Al6—Si5$^{viii}$ | 60.241 (11) |
| Si2$^{iii}$—Ru1—Al8$^{iv}$ | 102.208 (12) | Si7$^{viii}$—Al6—Si5$^{viii}$ | 75.712 (14) |
| Al8—Ru1—Al8$^{iv}$ | 64.665 (12) | Si7—Al6—Si5$^{viii}$ | 103.993 (19) |
| Al8$^{ii}$—Ru1—Al8$^{iv}$ | 60.083 (11) | Si2$^{xix}$—Al6—Si5$^{viii}$ | 119.817 (12) |
| Si5—Ru1—Al8$^{iv}$ | 124.747 (12) | Si2$^{iii}$—Al6—Si5$^{viii}$ | 171.91 (2) |
| Si7—Ru1—Al8$^{iv}$ | 107.354 (10) | Si5—Al6—Si5$^{viii}$ | 56.480 (18) |
| Si5—Si2—Ru1$^{xvii}$ | 114.396 (11) | Ru1—Al6—Si7$^{ii}$ | 57.194 (10) |
| Si5—Si2—Ru1$^{vii}$ | 114.396 (11) | Ru1$^{viii}$—Al6—Si7$^{ii}$ | 115.982 (18) |
| Ru1$^{xvii}$—Si2—Ru1$^{vii}$ | 113.304 (16) | Si7$^{viii}$—Al6—Si7$^{ii}$ | 175.46 (2) |
| Si5—Si2—Si3$^{v}$ | 137.34 (2) | Si7—Al6—Si7$^{ii}$ | 119.334 (12) |
| Ru1$^{xvii}$—Si2—Si3$^{v}$ | 56.663 (8) | Si2$^{xix}$—Al6—Si7$^{ii}$ | 101.833 (18) |
| Ru1$^{vii}$—Si2—Si3$^{v}$ | 56.663 (8) | Si2$^{iii}$—Al6—Si7$^{ii}$ | 72.165 (13) |
| Si5—Si2—Al6$^{vi}$ | 112.887 (16) | Si5—Al6—Si7$^{ii}$ | 72.836 (15) |
| Ru1$^{xvii}$—Si2—Al6$^{vi}$ | 53.884 (7) | Si5$^{viii}$—Al6—Si7$^{ii}$ | 99.76 (2) |
| Ru1$^{vii}$—Si2—Al6$^{vi}$ | 131.23 (2) | Ru1—Al6—Si7$^{xiv}$ | 115.982 (18) |
| Si3$^{v}$—Si2—Al6$^{vi}$ | 94.539 (15) | Ru1$^{viii}$—Al6—Si7$^{xiv}$ | 57.194 (10) |
| Si5—Si2—Al6$^{vii}$ | 112.887 (16) | Si7$^{viii}$—Al6—Si7$^{xiv}$ | 119.335 (12) |
| Ru1$^{xvii}$—Si2—Al6$^{vii}$ | 131.23 (2) | Si7—Al6—Si7$^{xiv}$ | 175.46 (2) |
| Ru1$^{vii}$—Si2—Al6$^{vii}$ | 53.884 (7) | Si2$^{xix}$—Al6—Si7$^{xiv}$ | 72.165 (13) |
| Si3$^{v}$—Si2—Al6$^{vii}$ | 94.539 (15) | Si2$^{iii}$—Al6—Si7$^{xiv}$ | 101.833 (18) |
| Al6$^{vi}$—Si2—Al6$^{vii}$ | 96.71 (2) | Si5—Al6—Si7$^{xiv}$ | 99.76 (2) |
| Si5—Si2—Si2$^{viii}$ | 87.421 (13) | Si5$^{viii}$—Al6—Si7$^{xiv}$ | 72.836 (15) |
| Ru1$^{xvii}$—Si2—Si2$^{viii}$ | 112.394 (9) | Si7$^{ii}$—Al6—Si7$^{xiv}$ | 58.805 (16) |
| Ru1$^{vii}$—Si2—Si2$^{viii}$ | 112.394 (9) | Si7$^{xv}$—Si7—Ru1$^{xvii}$ | 111.632 (8) |
| Si3$^{v}$—Si2—Si2$^{viii}$ | 135.240 (14) | Si7$^{xv}$—Si7—Ru1 | 109.982 (7) |
| Al6$^{vi}$—Si2—Si2$^{viii}$ | 58.617 (10) | Ru1$^{xvii}$—Si7—Ru1 | 116.489 (12) |
| Al6$^{vii}$—Si2—Si2$^{viii}$ | 58.617 (10) | Si7$^{xv}$—Si7—Si3$^{i}$ | 62.385 (8) |
| Ru1$^{x}$—Si3—Ru1$^{xi}$ | 122.944 (17) | Ru1$^{xvii}$—Si7—Si3$^{i}$ | 111.082 (14) |
| Ru1$^{x}$—Si3—Si4$^{viii}$ | 118.472 (9) | Ru1—Si7—Si3$^{i}$ | 54.602 (9) |
| Ru1$^{xi}$—Si3—Si4$^{viii}$ | 118.472 (9) | Si7$^{xv}$—Si7—Al8 | 123.630 (11) |
| Ru1$^{x}$—Si3—Si2$^{xviii}$ | 61.485 (9) | Ru1$^{xvii}$—Si7—Al8 | 59.457 (9) |
| Ru1$^{xi}$—Si3—Si2$^{xviii}$ | 61.485 (9) | Ru1—Si7—Al8 | 57.864 (9) |

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|---|---|---|---|
| Si4$^{viii}$—Si3—Si2$^{xviii}$ | 174.90 (2) | Si3$^{i}$—Si7—Al8 | 70.290 (12) |
| Ru1$^{x}$—Si3—Al8$^{ix}$ | 134.314 (19) | Si7$^{xv}$—Si7—Al6 | 107.139 (13) |
| Ru1$^{xi}$—Si3—Al8$^{ix}$ | 67.148 (10) | Ru1$^{xvii}$—Si7—Al6 | 140.547 (17) |
| Si4$^{viii}$—Si3—Al8$^{ix}$ | 68.456 (15) | Ru1—Si7—Al6 | 53.439 (8) |
| Si2$^{xviii}$—Si3—Al8$^{ix}$ | 107.696 (16) | Si3$^{i}$—Si7—Al6 | 92.927 (14) |
| Ru1$^{x}$—Si3—Al8$^{viii}$ | 67.148 (10) | Al8—Si7—Al6 | 103.982 (14) |
| Ru1$^{xi}$—Si3—Al8$^{viii}$ | 134.314 (19) | Si7$^{xv}$—Si7—Si7$^{viii}$ | 89.999 (1) |
| Si4$^{viii}$—Si3—Al8$^{viii}$ | 68.456 (15) | Ru1$^{xvii}$—Si7—Si7$^{viii}$ | 113.363 (7) |
| Si2$^{xviii}$—Si3—Al8$^{viii}$ | 107.696 (17) | Ru1—Si7—Si7$^{viii}$ | 112.333 (7) |
| Al8$^{ix}$—Si3—Al8$^{viii}$ | 76.42 (2) | Si3$^{i}$—Si7—Si7$^{viii}$ | 133.900 (10) |
| Ru1$^{x}$—Si3—Si7$^{x}$ | 62.028 (9) | Al8—Si7—Si7$^{viii}$ | 146.312 (11) |
| Ru1$^{xi}$—Si3—Si7$^{x}$ | 110.212 (16) | Al6—Si7—Si7$^{viii}$ | 58.914 (9) |
| Si4$^{viii}$—Si3—Si7$^{x}$ | 100.475 (18) | Si7$^{xv}$—Si7—Al6$^{vi}$ | 111.613 (13) |
| Si2$^{xviii}$—Si3—Si7$^{x}$ | 84.035 (16) | Ru1$^{xvii}$—Si7—Al6$^{vi}$ | 52.782 (8) |
| Al8$^{ix}$—Si3—Si7$^{x}$ | 162.921 (18) | Ru1—Si7—Al6$^{vi}$ | 137.671 (17) |
| Al8$^{viii}$—Si3—Si7$^{x}$ | 112.484 (11) | Si3$^{i}$—Si7—Al6$^{vi}$ | 161.207 (16) |
| Ru1$^{x}$—Si3—Si7$^{xi}$ | 110.212 (16) | Al8—Si7—Al6$^{vi}$ | 103.230 (14) |
| Ru1$^{xi}$—Si3—Si7$^{xi}$ | 62.028 (9) | Al6—Si7—Al6$^{vi}$ | 105.829 (11) |
| Si4$^{viii}$—Si3—Si7$^{xi}$ | 100.475 (18) | Si7$^{viii}$—Si7—Al6$^{vi}$ | 60.597 (8) |
| Si2$^{xviii}$—Si3—Si7$^{xi}$ | 84.035 (16) | Ru1—Al8—Si3$^{viii}$ | 103.213 (14) |
| Al8$^{ix}$—Si3—Si7$^{xi}$ | 112.484 (11) | Ru1—Al8—Ru1$^{xvii}$ | 117.073 (14) |
| Al8$^{viii}$—Si3—Si7$^{xi}$ | 162.921 (18) | Si3$^{viii}$—Al8—Ru1$^{xvii}$ | 137.009 (16) |
| Si7$^{x}$—Si3—Si7$^{xi}$ | 55.233 (16) | Ru1—Al8—Si7 | 60.413 (10) |
| Si4$^{xii}$—Si4—Ru1$^{xiii}$ | 111.712 (13) | Si3$^{viii}$—Al8—Si7 | 162.927 (17) |
| Si4$^{xii}$—Si4—Ru1 | 111.713 (13) | Ru1$^{xvii}$—Al8—Si7 | 57.501 (9) |
| Ru1$^{xiii}$—Si4—Ru1 | 123.183 (18) | Ru1—Al8—Al8$^{xvi}$ | 166.190 (12) |
| Si4$^{xii}$—Si4—Si3$^{viii}$ | 87.82 (2) | Si3$^{viii}$—Al8—Al8$^{xvi}$ | 81.071 (16) |
| Ru1$^{xiii}$—Si4—Si3$^{viii}$ | 108.238 (13) | Ru1$^{xvii}$—Al8—Al8$^{xvi}$ | 63.478 (11) |
| Ru1—Si4—Si3$^{viii}$ | 108.238 (13) | Si7—Al8—Al8$^{xvi}$ | 115.988 (15) |
| Si4$^{xii}$—Si4—Si5 | 158.73 (3) | Ru1—Al8—Ru1$^{iv}$ | 115.335 (12) |
| Ru1$^{xiii}$—Si4—Si5 | 63.047 (10) | Si3$^{viii}$—Al8—Ru1$^{iv}$ | 54.048 (10) |
| Ru1—Si4—Si5 | 63.046 (10) | Ru1$^{xvii}$—Al8—Ru1$^{iv}$ | 114.514 (12) |
| Si3$^{viii}$—Si4—Si5 | 113.45 (2) | Si7—Al8—Ru1$^{iv}$ | 134.909 (17) |
| Si4$^{xii}$—Si4—Al8$^{xiii}$ | 127.17 (2) | Al8$^{xvi}$—Al8—Ru1$^{iv}$ | 56.439 (12) |
| Ru1$^{xiii}$—Si4—Al8$^{xiii}$ | 57.123 (9) | Ru1—Al8—Si4 | 53.750 (9) |
| Ru1—Si4—Al8$^{xiii}$ | 115.901 (18) | Si3$^{viii}$—Al8—Si4 | 54.678 (14) |
| Si3$^{viii}$—Si4—Al8$^{xiii}$ | 56.864 (14) | Ru1$^{xvii}$—Al8—Si4 | 144.883 (17) |
| Si5—Si4—Al8$^{xiii}$ | 69.132 (14) | Si7—Al8—Si4 | 108.417 (15) |
| Si4$^{xii}$—Si4—Al8 | 127.17 (2) | Al8$^{xvi}$—Al8—Si4 | 134.546 (16) |
| Ru1$^{xiii}$—Si4—Al8 | 115.902 (18) | Ru1$^{iv}$—Al8—Si4 | 97.920 (13) |
| Ru1—Si4—Al8 | 57.123 (9) | Ru1—Al8—Al8$^{iv}$ | 61.104 (11) |
| Si3$^{viii}$—Si4—Al8 | 56.864 (14) | Si3$^{viii}$—Al8—Al8$^{iv}$ | 68.684 (15) |
| Si5—Si4—Al8 | 69.132 (14) | Ru1$^{xvii}$—Al8—Al8$^{iv}$ | 144.14 (2) |
| Al8$^{xiii}$—Si4—Al8 | 67.682 (18) | Si7—Al8—Al8$^{iv}$ | 103.923 (19) |
| Si2—Si5—Si4 | 114.32 (2) | Al8$^{xvi}$—Al8—Al8$^{iv}$ | 109.65 (2) |
| Si2—Si5—Ru1 | 110.218 (11) | Ru1$^{iv}$—Al8—Al8$^{iv}$ | 54.231 (12) |

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|---|---|---|---|
| Si4—Si5—Ru1 | 57.562 (8) | Si4—Al8—Al8$^{iv}$ | 66.587 (13) |
| Si2—Si5—Ru1$^{xiii}$ | 110.218 (11) | | |

Symmetry codes: (i) −*x*+1/2, −*y*+1/2, *z*−1/2; (ii) −*x*+1/2, *y*−1/2, *z*; (iii) *x*+1/2, *y*−1/2, *z*; (iv) −*x*+1/2, −*y*+1/2, −*z*; (v) −*x*, −*y*+1, *z*−1/2; (vi) −*x*+1/2, *y*+1/2, −*z*+1/2; (vii) *x*−1/2, *y*+1/2, *z*; (viii) *x*, *y*, −*z*+1/2; (ix) −*x*, *y*, −*z*+1/2; (x) −*x*+1/2, −*y*+1/2, *z*+1/2; (xi) *x*−1/2, −*y*+1/2, *z*+1/2; (xii) −*x*, −*y*, −*z*; (xiii) −*x*, *y*, *z*; (xiv) −*x*+1/2, *y*−1/2, −*z*+1/2; (xv) −*x*+1, *y*, *z*; (xvi) *x*, −*y*+1, −*z*; (xvii) −*x*+1/2, *y*+1/2, *z*; (xviii) −*x*, −*y*+1, *z*+1/2; (xix) *x*+1/2, *y*−1/2, −*z*+1/2.