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Lattice row distance

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Lattice and diffraction are two relating aspects of a crystal. The former reflects the nature of a crystal and the latter describes the basic feature of a crystal. A lattice possesses points and rows two basic characteristics. Great attention has been paid to the points and their distances and directions (angles) they form since the early time of crystallography. Starting from lattice points people have already revealed and found so many regulations in crystals and made great progresses in crystallography. What about the lattice rows? Starting from the geometric relations of reciprocal lattice, we propose six general formulae [1] to describe the relationships between the lattice row distance, the Miller indices h, k, l and the lattice parameters for all crystal systems along any direction. This, like the lattice points, establishes the foundation of the row-indexing, row-refinement of lattice parameters and row-determination of incidence direction theoretically. It is a new method from the lattice row distance to the Miller indices, to the lattice parameters or to the incidence direction. Five steps are optimized for the procedure of "Row-indexing" or "Row-refinement". For example, the procedure of row-indexing is described as 1) measurement of row distance; 2) calculation of row distance; 3) comparison of the measured with the calculated row distances; 4) indexing, and 5) check according to the crystallographic regulations. In respect to diffraction patterns, a series of diffraction spots (points) comprise row(s) and arrange into a series of parallel "lines". When diffraction is strong, diffraction spots are isolated and sharp. However, when diffraction is weak, those spots are obscure or gloomy and often distorted into elongation, asymmetry, deformation, etc. This leads to the outstanding of the rowing "lines" relatively and hence, the row-distance formulae are able to be utilized to structure analysis for those "linear diffraction patterns".

[1] *T. Li, H. Wang, E. Fan, L. Wang, Z. Zhou, Z Kristallogr. 2012, 227, 665-671.*

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