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Compressed alkali and alkali-earth metals: Understanding structure through Jones zone activation. Valentina F. Degtyareva. *Institute of Solid State Physics Russian Academy of Sciences, Chernogolovka, Russia.*
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Under compression, simple *s*-bonded alkali and alkali-earth metals pass through the sequence of phases characterized by lowering in symmetry, coordination number and packing density [1,2]. Structural transformations in these metals are controlled by the combined effects of electrostatic (Madelung) and electronic (band-structure) contributions to the crystal energy. The latter term increases with pressure yielding low-symmetry complex structures, such as *cI*16 in Li and Na, Rb-*oC*52 and Cs-*oC*84. Stability of these structures can be supported by a Hume-Rothery argument when new diffraction plains appear close to the Fermi level [3]. Effect of *pressure induced Jones plane activation* was considered theoretically recently by Ashcroft and coworkers [4].
Upon further compression heavy alkalis Cs and Rb form a very open structure *tI*4 with coordination number 4+4 and packing density ~0.56. Considering the Brillouin zone configuration with respect to the Fermi sphere one can conclude that the Hume-Rothery mechanism is effective if the number of valence electrons increases from 1 up to 2 and higher values implying the transition of the outer core electrons into the valence band. Similar changes in the valence state are expected for compressed Na at the transition from *cI*16 to *oP*8 at pressures above 117 GPa [2,5]. Observations of the simple cubic structure in Ca (above 32 GPa) and the beta-tin structure in Sr (above 25 GPa) imply the increase in the number of valence electrons resulting from the core ionization.

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