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The Single Phase and Two-phase Equations of State for Aluminum LIU HAIFENG, SONG HAIFENG, ZHANG GONGMU, LCP, Institute of Applied Physics and Computational Mathematics — We present a single phase and a two-phase(solid-liquid) equations of state (EOS) for aluminum. The single phase EOS is based on the theory of Born. The free energy contains three terms. The 0K static energy is expressed as the Born-Mayer potential, the thermal free energy from electronic excitations is formulated as Al'tshuler's model, and the vibrational free energy of the lattice ion is expressed as the modified Debye model, which considers the high-temperature anharmonic effects by the empirical interpolation between a solid under normal conditions and an ideal gas. The two-phase EOS follows the method used by Chisolm et al to determine solid and liquid EOS for aluminum. The two equations reproduce the experimentally measured Hugoniot data and melting curve. It is shown that the difference between two equations is obvious on the boundary of solid and liquid. We also discuss the range of validity for the EOS. These results allow us to comment the effect of melting on EOS.

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