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A multiphase equation of state for tin and its application in shock experiment SONG HAIFENG, LIU HAIFENG, ZHANG GUANGCAI, ZHANG GONGMU, Institute of Applied Physics and Computational Mathematics — We present a first-principles scheme to study the equation of state (EOS) for tin in the β and γ phases, based on our recently developed modified mean-field potential approach. By taking the effect of the structural parameters on the free energy into account, we investigate the ground-state properties of Tin at ambient conditions, structural parameters varying with temperature and pressure, and Hugoniot curve. The calculated properties are in good agreement with available experimental data. From these first-principles calculations, we obtain some EOS's parameters, and then built an empirical thermodynamically consistent Mie-Grüneisen EOS for tin in the β and γ phases. Combined with the empirical EOS and a hydrocode, we undertake a numerical simulation of shock experiments on tin that have been reported in the literature. The simulation results are successful in reproducing the measured velocity profile, and further understand the complex behavior of tin under shock-wave loading.

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