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Density-Functional-Theory–Based Equation-of-State Table of Beryllium for Inertial Confinement Fusion Applications Y.H. DING, S.X. HU, Laboratory for Laser Energetics, U. of Rochester — Beryllium has been considered a superior ablator material for inertial confinement fusion target designs. Based on density-functional-theory calculations, we have established a wide-range beryllium equation-of-state (EOS) table of density $\rho = 0.001$ to $\rho = 500$ g/cm^3 and temperature $T = 2000$ to 10^8 K. Our first-principles equation-of-state (FPEOS) table[1] is in better agreement with widely used *SESAME* EOS table (*SESAME* 2023) than the average-atom *INFERNO* model and the *Purgatorio* model. For the principal Hugoniot, our FPEOS prediction shows ∼10% stiffer behavior than the last two models at maximum compression. Comparisons between FPEOS and *SESAME* for off-Hugoniot conditions show that both the pressure and internal energy differences are within ∼20% between two EOS tables. By implementing the FPEOS table into the 1-D radiation–hydrodynamics code *LILAC*, we studied the EOS effects on beryllium target-shell implosions. The FPEOS simulation predicts up to an ∼15% higher neutron yield compared to the simulation using the *SESAME* 2023 EOS table. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

[1]Y. H. Ding and S. X. Hu, Phys. Plasmas **24**, 062702 (2017).

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