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Average ionization EOS model for high-Z plasmas and applications HYOUNGKEUN KIM, LINA ZHANG, Stony Brook University, ROMAN SAMULYAK, Stony Brook University and Brookhaven National Laboratory, PAUL PARKS, General Atomics — A numerical model for average ionization EOS for high-Z plasmas undergoing multiple ionization processes has been developed based on the Zeldovich model. The corresponding software library has been implemented in FronTier, a hydrodynamic code that explicitly tracks material interfaces via the front tracking method, and verified with respect to solutions of coupled systems of Saha equations. FronTier with this EOS model has been used for simulations of the formation and implosion of plasma liners in the concept of Plasma Jet driven Magneto-Inertial Fusion (PJMIF) and the pellet ablation in tokamaks. We showed that in PJMIF simulations, atomic processes are responsible for significant pressure increases in self-imploding argon liners [1] and the overall change of dynamics of the jet merger via a cascade of oblique shock waves [2]. In pellet ablation simulations, the ablation rate of neon and argon pellets decreased due to ionization-induced energy sinks, and the ablation flow reached a double transonic state similar to that observed in deuterium pellets.

[1] H. Kim et. al, Phys. Plasmas, 19:082711 (2012).
[2] H. Kim et al., Phys. Plasmas 20, 022704 (2013).

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