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An Ionization and Equation of State Model for Dense, Plasma Mixtures[1] LIAM STANTON, Lawrence Livermore National Laboratory, ROBERT ARGUS, OLGA DORABIALA, ZANDER KELLEY, BRANDON SRIPIMONWAN, Institute for Pure and Applied Mathematics, CHRISTIAN SCULLARD, FRANK GRAZIANI, Lawrence Livermore National Laboratory, YANNAN SHEN, California State University, Northridge, MICHAEL MURILLO, Michigan State University —
Almost all high energy-density physics experiments involve a multitude of species, which introduces nontrivial challenges to the models for both theoretical and practical reasons. To make matters worse, the ionic species will be composed of multiple ionization states themselves. The theoretical connection to the single-species properties, such as the transport coefficients or equations of state, is rarely as straightforward as a simple superposition. Additionally, our knowledge of such mixtures must span orders of magnitude in temperature and density, and impurities from higher-Z elements can fundamentally change the physical properties of the plasma as well. Here, we present a new model that can accurately and efficiently predict ionization, thermodynamic and correlational properties of dense plasma mixtures over a wide range parameter. This model is not only applicable to mixtures of an arbitrary number of ionic components, but it resolves properties of individual ionization states as well.

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