Overview

Abstract

A quantitative equation of state (EOS) model has been developed to perform integral neutral fusion energy (IFE) target chamber calculations. The EOS model provides a good description of the state of the plasma for IFE fusion chamber design studies. This study describes the implementation of the EOS, as well as some of the results obtained from the EOS calculations performed on the LIFE inertial confinement fusion reactor design study, subcontract No. B-587835.

Material Ionization Model

The ionization model is an improved low-temperature equation of state (LTE) for xenon. This model is based on the Busquet model, but uses the Thomas-Fermi ionization model for comparison. The resulting model is compared with the SESAME data file and the corresponding values from BADGER using an LTE ionization state model.

Ion and Electron EOS Models

The electron equation of state used in the IEM is based on a free-energy minimization method developed by Davis et al. [6]. The problem simulated is that of an ideal gas EOS model, the high-density plasma exhibits non-ideal effects. The solution to the problems highlighted above is making available a software library that can perform in-line calculations of the isotopic composition.

Using BADGER in Integrated IFE Simulations

The solution to the problems highlighted above is making available a software library that can perform in-line calculations of the isotopic composition. Once the mixtures are calculated the isotopic composition is determined by the equilibrium state model.

References


Acknowledgement

The authors of this paper would like to thank Dr. Mildred Labate at the University of Chicago for her contribution to the paper through her critical evaluation of the benchmark plasma simulations using the BADGER equation of state data.

An improved low-temperature equation of state model for integrated IFE target response simulations

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Support for This Research

This work was developed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract 7C-1215-0603. The U.S. Government retains for itself and others authorized by it, a non-exclusive, paid-up, irrevocable worldwide license in said subject to U.S. Government rights.

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