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STUDY OF THE STATISTICAL AND RADIATIVE PROPERTIES OF DENSE PLASMA

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The radiative properties of an ion surrounded by a plasma are modified by various mechanisms. One of them, the ionization potential depression (IPD) affects both the radiative properties of the different ionic states and their populations. It is due to the surrounding charges of the radiator which contribute to the lowering of the energy necessary to free an electron in the ground state. Two distinct models, namely Stewart-Pyatt (Stewart and Pyatt, 1966) and Ecker-Kröll (Ecker G and Kröll W 1963) models are widely used to estimate IPD.

An approach based on classical molecular dynamics simulation has been developed providing an alternative way to calculate the IPD (Calisti A, et al. 2015). Ions and electrons are treated as classical particles and some quantum properties are taken into account through a regularized potential allowing to model collisional ionization and recombination processes. The related numerical code, BinGo-TCP, has been designed to describe neutral mixtures composed of ions of the same atom with different charge states, and electrons. Within the limits of classical mechanics, all charge-charge interactions are accounted for in the particle motion.

In this work, the importance of the choice of the IPD modeling will be emphasized through a study of some dense plasma radiative properties. We will also discuss the ionization energy distributions obtained with BinGo-TCP due to the fluctuating environment of the ions.

References

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