Microscopic modelling of laser interaction with foam targets

Abstract: Foams are frequently used as targets in laser-plasma interaction experiments related to inertial confinement fusion and bright X-ray sources. They can be rapidly converted from a structured solid material into a quasi-homogeneous plasma under intense irradiation. The temperature of this plasma can be varied by choosing the laser irradiation intensity and wavelength. Foam targets have been proposed to mitigate laser-imprint effects in direct-drive inertial fusion implosions, and CH foams wetted with liquid DT are proposed to replace DT ice in capsules to simplify target fabrication technology and improve homogeneity. Foams are promising materials for generation of bright X-rays (γ-rays) [1-2] for applications such as radiography of dense plasmas, material testing, national security etc. We will study the microscopic physics (ionization, expansion of foam cells, homogenization of the resulting plasma, generation of energetic electrons, X-rays etc.) of the laser interaction with the foam target using kinetic simulations based on the Particle-in-cell method.

[1] https://doi.org/10.1063/5.0024682

[2] https://doi.org/10.1038/s41467-021-27694-7

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