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Systematic *ab-initio* Calculations of Optical Properties of Silicon for Inertial Confinement Fusion Applications[1] VALENTIN KARASIEV, SUXING HU, University of Rochester — Silicon is one of the mid-Z materials used in inertial confinement fusion (ICF) capsules to reduce laser imprint, prevent fuel preheat, and mitigate laser–plasma instability effects. Accurate knowledge of optical properties such as x-ray absorption is crucial for understanding the material response to external electromagnetic radiation and proper ICF target design. In this talk, we will report on systematic calculations of optical properties of silicon in a wide range of material densities and temperatures by means of *first-principles* method based on density functional theory, which take into account quantum effects that are essential in warm-dense-matter regime. Transport properties (thermal and electrical conductivity, dielectric function, index of refraction, reflectivity, absorption, and opacity) of warm dense silicon are calculated within the Kubo–Greenwood formulation with use of the thermal exchange correlation functional and the all-electron projector augmented wave (PAW) data set that is required to provide transferability to extreme conditions of high pressure and temperature. All-electron PAW is also necessary to calculate optical properties in the x-ray range.

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Valentin Karasiev
University of Rochester

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