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Ultrafast melting and solidification of Ag studied by time-resolved third harmonic generation WAI LUN CHAN, VIRGINIA MCCREARY, ALEXIE LAGOUTCHEV, University of Illinois, Urbana-Champaign, YINON ASHKENAZY, The Hebrew University of Jerusalem, KWANGU KANG, DAVID CAHILL, ROBERT AVERBACK, University of Illinois, Urbana-Champaign
— We study the transformation of Ag between the solid and liquid phases using pump-probe femtosecond laser experiments. A pump with fluences of 100-500 mJ cm^{-2} is used to heat the sample while third harmonic generation of light from a time-delayed probe is used to determine the structure as a function of time. For the melting experiment, we find that the solid begins to melt before the phonons are thermalized by the electrons, according to the two-temperature model. In addition, we find by using Ag thin films with different thicknesses, that the depth of heat deposition is less than 100nm. Both observations suggest that the established two-temperature model is insufficient to explain the melting kinetics in Ag by the femto-second laser. For the solidification experiment, we are able to determine the solidification velocity as a function of undercooling down to half of the melting temperature. The results are compared to predictions form molecular dynamics simulations.

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