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Properties of Water/Gold Nanofluids GIANLUCA PULITI, SAMUEL PAOLUCCI, MIHIR SEN, University of Notre Dame — Nanofluids are believed to have enhanced thermophysical properties and heat transfer performance. The novelty of this work is in a comprehensive approach to understanding nanofluids through the use of molecular dynamics simulations with accurate potentials to model realistic materials. Specifically, this study treats the case of water confined between gold nanolayers to examine interfacial interactions and a water-based nanofluid with spherical gold nanoparticles. Properties are discussed for both systems. While the thermodynamic properties of the mixture are typically predicted using ideal mixture theory, such predictions are found to be generally poor for nanofluids. The anisotropy induced by the gold-water interface, and its effects, appear to be responsible for the disagreement. Transport properties, show a much more peculiar trend: the presence of nanoparticles has no effect on self-diffusion while viscosity increases drastically with respect to the prediction of classical theories. It is interesting to note that the thermal conductivity of nanofluids is enhanced for low particle concentrations, but it is below the prediction of classical theories for higher volume fractions. Interfacial effects appear, once again, to be responsible for such trend in transport properties.

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