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Augmented Brownian motion in micro-nanoscale multi-phase dynamics JARROD SCHIFFBAUER, TREY JIRON, Colorado Mesa Univ, DEZHAO HUANG, EUNGKYU LEE, TENGFEI LUO, University of Notre Dame — Mesoscopic hydrodynamics and Langevin dynamics may be applied to a variety of problems concerning active colloids, nanoscale phase change, and bubble/droplet transport, providing a powerful compliment to experimental methods as well as materials and device design. This presentation focuses on two theoretical-numerical studies concerning mesoscale Brownian dynamics of colloidal and bubble-droplet transport. First, the problem of a Brownian particle being driven through a 1D periodic "tilted washboard" potential is revisited, and a novel negative differential mobility is observed prior to the onset of the well-known giant diffusion enhancement effect. The second problem concerns the calculation of the effective friction for a model of a heated nanoparticle undergoing a kind of ballistic-Brownian motion in its own vapor bubble formed via plasmonic super-cavitation. Both molecular dynamics simulations and a simplified hydrodynamics model are employed. The resulting motion is shown to be distinct from the hot Brownian motion observed elsewhere and relies on the (nearly) discontinuous change in properties between the vapor bubble and surrounding liquid. Applications and extensions of the theoretical framework of these models are discussed.

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