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Strong plastic deformation and softening of fast colliding Lennard-Jones nanoparticles by Molecular Dynamics simulations[1]
YOICHI TAKATO, SURAJIT SEN, State University of New York at Buffalo, JEREMY LECHMAN, Sandia National Laboratories — We present a Molecular Dynamics study of the coefficient of restitution e for colliding two equal sized nanoparticles. Nanoparticles often show distinctly different mechanical and dynamical properties than bulk materials. We investigate the collision velocity $v_{\rm coll}$ and the nanoparticle size dependence of coefficient of restitution. We find that the size dependent yield velocity v_Y, a sharp crossover point between elastic collision and plastic collision, appears to approach the theoretical constant value for macroscopic spheres as the nanoparticle size grows. We also find that above v_Y, the coefficient of restitution $e \propto v_{\rm coll}^{-\alpha}$, where $\alpha \sim 1$, which is distinct from the inelastic macroscopic sphere collision case, $\alpha = 1/4$. It indicates that nanoparticles colliding at high collision velocity are softened. We discuss possible insights of the size dependent yield velocity and the soft nanoparticles above v_Y.

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