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Molecular dynamics study on a nonequilibrium motion of a colloidal particle driven by an external torque DONGHWAN YOO, Myongji University, YOUNGKYUN JUNG, KISTI, CHULAN KWON, Myongji University
— We investigate the motion of a colloidal particle driven out of equilibrium by an external torque. We use the molecular dynamics simulation that is alternative to the simulation based on the Langevin equation and is expected to mimic an experiment more realistically. We choose a heat bath composed of about a thousand particles interacting to each other through the Lenard-Jones potential and impose the Langevin thermostat to maintain it in equilibrium. We prepare a colloidal particle to interact with the particles of the heat bath also by the Lenard-Jones potential while any dissipative force and noise are not employed explicitly. We study the stochastic properties of the nonequilibrium fluctuation for work and heat produced incessantly in the steady state. We accurately confirm the fluctuation theorem for the work production. We also investigate the motion beyond the overdamped limit by varying the mass of the particle. We compare our result with a previous theoretical result in the overdamped limit based on the Langevin equation[1].

[1]C. Kwon, J. D. Noh, and H. Park, Phys. Rev. E **83**, 061145 (2011).

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