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Brownian dynamics of colloids in tilted periodic potential[1]
WEIQIANG MU, Northwestern University, GANG WANG, Indiana University, Purdue University Fort Wayne, GABRIEL SPALDING, Illinois Wesleyan University, JOHN KETTERSON, Northwestern University — We have studied the Brownian movements of micron-sized colloidal spheres in the presence of a periodic potential and the potential associated with gravity (which together form a so-called tilted-washboard potential). The optical potential is generated by the interference of two argon laser beams that are tightly focused through a common objective lens to form an in-plane standing wave in the vicinity of a substrate surface. As the intensity of standing wave is increased, the escape time of a particle trapped in a given potential well to the next lower one increases super-exponentially. More generally we have measured the time dependence of the probability density distribution of a colloidal particle as a function of the amplitude of the standing wave. The experimental data have been compared with a simulation based on the numerical integration of the Smoluchowski equation in the presence of the optical and gravitational potentials.

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