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Colloids in a periodic potential: driven lattice gas in continuous space[1] RONALD DICKMAN, UFMG, FABRICIO POTIGUAR — Motivated by recent studies of colloidal particles in optical tweezer arrays, we study a two-dimensional model of a colloidal suspension in a periodic potential. The particles tend to stay near potential minima, approximating a lattice gas. The interparticle interaction, a sum of Yukawa terms, features short-range repulsion and attraction at somewhat larger separations, such that two particles cannot occupy the same potential well, but occupation of adjacent cells is energetically favored. Monte Carlo simulation reveals that the equilibrium system exhibits condensation, as in the Ising model/lattice gas with conserved magnetization; the transition appears to be continuous at a half occupancy. We study the effect of biased hopping, favoring motion along one lattice direction. This system is found to exhibit features of the driven lattice gas: the interface is oriented along the drive, and appears to be smooth. A weak drive facilitates ordering of the particles into high- and low-density regions, while stronger bias tends to destroy order, and leads to very large energy fluctuations. We also study ordering in a *moving* periodic potential. Our results suggest possible realizations of equilibrium and driven lattice gases in a colloidal suspension subject to an optical tweezer array.

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