Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Dynamics of particles with key-lock interactions[1] NICHOLAS LICATA, ALEXEI TKACHENKO, University of Michigan — We present a theoretical discussion of particles which interact through the reversible formation of multiple key-lock bridges. Two potential experimental realizations include DNA- grafted particles which interact with a two-dimensional DNA substrate, and particles grafted with antibodies interacting with a protein substrate. We argue there is a percolation transition characterized by the average number of bridges realized between a particle and the substrate. The transition separates a regime in which particles are localized from a diffusive regime where they explore the substrate surface through mutiple breaking and reconnecting of bridges. This diffusion behavior is dispersive, characterized by $\langle r^2(t)\rangle \sim t^\alpha$ with $\alpha < 1$. The distribution of departure times in a multi-particle system is calculated in two different models which account for the particle dynamics above and below the percolation threshold.

[1]This work was supported by the ACS Petroleum Research Fund (PRF Grant No. 44181-AC10) and by the Michigan Center for Theoretical Physics(MCTP Grant No. 06-03).

Nicholas Licata
University of Michigan

Date submitted: 17 Nov 2006 Electronic form version 1.4