Dynamics of particles with key-lock interactions\textsuperscript{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 multiple breaking and reconnecting of bridges. This diffusion behavior is dispersive, characterized by $\left\langle r^2(t)\right\rangle \sim t^\alpha$ 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.

\textsuperscript{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).