Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Random and ordered phases of off-lattice rhombus tiles[1] STEPHEN WHITELAM, ISAAC TAMBLYN, Molecular Foundry, Lawrence Berkeley National Lab, PETER BETON, JUAN GARRAHAN, School of Physics and Astronomy, University of Nottingham, Nottingham NG7 2RD, UK — We study the covering of the plane by non-overlapping rhombus tiles, a problem well-studied only in the limiting case of dimer coverings of regular lattices. We go beyond this limit by allowing tiles to take any position and orientation on the plane, to be of irregular shape, and to possess different types of attractive interactions. Using extensive numerical simulations we show that at large tile densities there is a phase transition from a fluid of rhombus tiles to a solid packing with broken rotational symmetry. We observe self-assembly of broken-symmetry phases, even at low densities, in the presence of attractive tile-tile interactions. Depending on tile shape and interactions the solid phase can be random, possessing critical orientational fluctuations, or crystalline. Our results suggest strategies for controlling tiling order in experiments involving "molecular rhombi."

[1]This work was supported by the Director, Office of Science, Office of Basic Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC02–05CH11231.

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Date submitted: 03 Nov 2011 Electronic form version 1.4