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Soft Spheres Make More Mesophases CHRISTIAN SANTANGELO, Department of Physics, University of Massachusetts, Amherst, MA 01003, MATTHEW GLASER, Department of Physics, University of Colorado, Boulder, CO 80309-0390, USA, GREGORY GRASON, Department of Polymer Science, University of Massachusetts, Amherst, MA 01003, USA, RANDALL KAMIEN, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19004, USA, ANDREIJ KOSMRLJ, Massachusetts Institute of Technology, Cambridge, MA 02139-4307, USA, PRIMOZ ZIHERL, Department of Physics, University of Ljubljana, Jadranska 19, SI-1000 Ljubljana, Slovenia — We use both mean-field methods and numerical simulation to study the phase diagram of classical particles interacting with a hard-core and repulsive, soft shoulder. Despite the purely repulsive interaction, this system displays a remarkable array of aggregate phases arising from the competition between the hard-core and shoulder length scales. In the limit of large shoulder width to core size, we argue that this phase diagram has a number of universal features, and classify the set of repulsive shoulders that lead to aggregation at high density. Surprisingly, the phase sequence and aggregate size adjusts so as to keep almost constant inter-aggregate separation.

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