

67b Structural Transitions in Two-Dimensional Charged and Hard-Sphere Systems

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The self-assembly of particles in two-dimensions is important in many industrial applications. For example, self-assembly provides a method to fabricate microstructured materials that are otherwise difficult to produce. We studied the ordering phenomena of charged as well as hard- sphere systems of granular materials, such as steel particles on a plastic surface and on the surface of a silicon wafer. We observed the self-ordering of the metal particles by varying the particle number density. The particles' positions were monitored by a video camera and their configurations analyzed. The particle charge was quantified by using the two different methods. We observed the particle structural transition by analyzing the particle radial distribution function, structural factors and the bond orientation order parameter. We also carried out the statistical mechanical calculations using Monte Carlo simulations, and the results were compared with the experiments. Our results show that with increasing particle number density, the many-body particle-particle interactions affect the structural transition.