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Resolving the two-dimensional self-assembly of iron oxide nanoparticles on a liquid surface JIAYANG HU, DATONG ZHANG, Columbia University, CHENGUANG LU, National Center for Nanoscience and Technology, SEUNG WHAN LEE, FAN YE, IRVING P. HERMAN, Columbia University — In situ small-angle X-ray scattering (SAXS) is used to monitor the self-assembly of iron oxide nanoparticles (NPs) dispersed in alkanes that are drop-cast on a diethylene glycol liquid surface. We found that the surface separations of NP cores in 2D superlattices (SLs) are generally farther apart than in 3D SLs with corresponding NPs. At these separations, the van der Waals (vdW) energy is smaller than the Brownian motion energy and so the previous 3D vdW force driven self-assembly models fail to explain the stable closed-packed structure. Strong ligand-ligand interactions likely bind the structure after the upper solvent dries. Entropy effects are found not to be the likely driving force for the observed close packing structures.

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