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Self-assembly of Iron Oxide Nanoparticles on Liquid Surfaces by Using Miscible Solvent Pairs JIAYANG HU, DATONG ZHANG, KATHLEEN M. KENNEDY, IRVING P. HERMAN, Columbia University — Nanoparticle (NP) self-assembly on liquid-air interfaces by using immiscible solvent pairs is a fast and effective way to prepare two-dimensional (2D) close-packed superlattices. However, this technique is limited by the number of available solvent pairs that are immiscible with each other while being different in the dispersity of NPs. Here, we report forming 2D superlattices using toluene/dimethyl sulfoxide miscible solvent pairs. In-situ small angle X-ray scattering patterns from NP layers sitting on the meniscus agree with patterns expected from 2D tilted closed packed superlattices. Real time optical microscopy shows that after drop casting, most of NPs coagulate immediately and sink to the bottom over several days, but leave a continuous ML on the surface, without forming 3D clusters that are usually seen in the immiscible techniques generated by the coffee ring effect. TEM images show that NPs nucleate simultaneously on different parts on the liquid surface until they touch, therefore covering the whole surface.

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