The Assembly of Nanoparticles at Liquid-Liquid Interfaces*

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The self-assembly of particles at fluid interfaces, driven by the reduction in interfacial energy, is well established. With nanoscopic particles, thermal fluctuations compete with the interfacial energy giving rise to a particle-size-dependent self-assembly. Ligand-stabilized nanoparticles are shown to assemble at fluid-fluid interfaces where the properties unique to the nanoparticles are preserved. The small size of the nanoparticles leads to a weak interfacial confinement that opens new avenues to size-selective particle assembly, two dimensional phase behavior and functionalization. Fluid interfaces afford a rapid approach to equilibrium and easy access to the nanoparticles for subsequent modification. Interfacial reaction of functionalized nanoparticles is shown to lead to crosslinked nanoparticle sheets, one nanoparticle diameter in thickness, that are ideal for the study of singularities in high-aspect ratio layers. The characteristic fluorescence emission of the nanoparticles provides a direct probe of their spatial distribution.

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