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Self-assembly and cross-linking of nanoparticles at liquid-liquid interfaces YAO LIN, ALEXANDER BOEKER, HABIB SKAFF, JINBO HE, KEVIN SILL, TODD EMRICK, ANTHONY DINSMORE, THOMAS RUSSELL, U. of Massachusetts, SU LONG, QIAN WANG, U. of South Carolina — The fabrication of functional nanostructured materials for sensing, encapsulation and delivery requires practical approaches to self-assembly on multiple length scales and the synthesis of tough yet permeable structures. Here, ligand-stabilized nanoparticles assembled into three-dimensional constructs at fluid-fluid interfaces driven by the reduction in interfacial energy were investigated. Studies on the dynamics of the nanoparticles and the self-assembled structures formed at the interface, using fluorescence photobleaching methods and in-situ grazing incidence small angle x-ray scattering, suggest a liquid-like behavior and ordering at the interfaces. Cross-linking of the nanoparticle assembly using functional ligands, affords robust membranes that maintain their integrity even when they are removed from the interface. These composite membranes, nanometers in thickness, are elastic yet permeable. The assembly of virus and other biological complexes at fluid interfaces was also investigated where interfacial assembly rendered an easy route to direct and assemble the bioparticles into 2-D and 3-D constructs with hierarchical ordering. These assemblies enable the potential use of the bioparticles as a natural supramolecular building block to obtain materials with well-defined bio-functionalities.

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