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Large-scale free-standing monolayer membranes of nanoparticles: preparation and properties JINBO HE, LASZLO FRAZER, James Franck Institute, University of Chicago, Chicago, Illinois 60637, USA, XIAO-MIN LIN, Materials Science Division, Chemistry Division and Center for Nanoscale Materials, Argonne National Laboratory, Argonne, Illinois 60439, USA, ADAM WEIS, HEINRICH JAEGER, James Franck Institute, University of Chicago, Chicago, Illinois 60637, USA — Two-dimensional arrays of close-packed nanoparticles can be stretched across tens-micrometre-size holes. The resulting freestanding monolayer membranes extend over hundreds of particle diameters without crosslinking of the ligands or further embedding in polymer. In our previous results of dodecanethiol-ligated 6-nm-diameter gold nanocrystal monolayers, we find a Young's modulus of the order of several GPa. This remarkable strength is coupled with high flexibility, enabling the membranes to bend easily while draping over edges. Recently we found that oleic-acid-covered cobalt nanoparticcles (∼9 nm in diameter) self-assemble at toluene/ethylene glycol interfaces and form large two-dimensional arrays. These membranes stretch across tens-of-micrometer holes after drying of ethylene glycol. The mechanical and diffusion properties of these membranes are tested and the response of these membranes under external fields is also investigated.

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