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Properties of Macroscopic Nanoparticle Assemblies Fabricated by Flexible Blade Flow Coating JONATHAN T. PHAM, DONG YUN LEE, JIMMY LAWRENCE, CHEOL HEE LEE, TODD EMRICK, ALFRED J. CROSBY, University of Massachusetts Amherst — Nanoparticle assemblies have gained much interest for their potential in electronic, photonic, optical, chemical, and biological applications. Although one of the greatest challenges is the controlled positioning of nanoscale components into the desired multi-length scale structures, understanding the properties of nanoparticle assemblies has also remained elusive. We have developed a technique termed flexible blade flow coating to direct the assembly of nanoparticles into ribbons and fabrics with a broad range of length scales. Ribbons and fabrics constructed with photoreactive quantum dots are crosslinked by UV irradiation affording long, flexible and robust structures that allow for subsequent liftoff from the substrate by dissolution of a sacrificial underlayer. The structural integrity of freely floating fabrics and extremely high aspect ratio ribbons are observed through fluorescence microscopy. Physical properties of these assemblies are explored with varying dimensions and ligand chemistry. We find that nanoparticle ribbons and fabrics possess unique properties in comparison to continuous polymer thin films, such as spherical wrapping and two-dimensional flexibility.

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