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Toward Dynamic Control over Ordered Nanoparticle Monolayer Fabrication by Electrophoretic Deposition[1] JAMES DICKERSON, ISABEL GONZALO-JUAN, ALEX KREJCI, Vanderbilt University — A primary challenges to the implementation of nanoparticles into device applications is the rapid production of densely packed, ordered films of these materials. The ordered arrangement of the nanomaterials is required for applications that rely on the collective interactions of the constituents or on the high density of the materials for information storage or surface protection. Rapid fabrication is a manufacturing demand to reduce operation costs and to streamline production. We have achieved a substantial milestone toward the mass production of macroscopic monolayers and thin films of colloidal nanocrystals on various substrates, including conducting metals and doped-semiconducting substrates. Our approach combines the advantages of liquid-phase, colloidal suspension approaches with the superior deposition rate, size scalability, and cost effective features of electrophoretic deposition (EPD) to achieve monolayer-by-monolayer deposition control over nanocrystal films with various degrees of internal order. Such work has the potential for the fabrication of industrial scale quantities and surface areas of these colloidal solids. Our recent research activities have demonstrated film formation with titanium dioxide nanoparticles and core/shell iron oxide nanoparticles.

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