Thin Films of Coupled Organic-Inorganic Nanostructures

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The concept of coupled organic-inorganic nanostructures provides a new approach to electronic applications of colloidal nanocrystal (NC) superlattices for power conversion or lighting purposes. [1] A typical superlattice consists of periodically alternating NCs and monolayers of coordinating organic semiconductor (OSC) small molecules, which act as electronic coupling agents to promote charge carrier transport across the lattice of NCs. I will show how the OSC is utilized to guide the self-assembly of semiconducting or metallic nanocrystals into quasi-2D thin films which are conductive and highly ordered at the same time. [2,3] The thin films are obtained as free-floating membranes at the liquid/air interface, transferred to solid substrates and characterized in real space by high-resolution TEM, HAADF-STEM as well as in reciprocal space by GIXD, GISAXS and simultaneous SAXS/WAXS utilizing a nano-beam set-up. The optoelectronic properties inferred from electric transport measurements, optical spectroscopy and transient absorption are discussed in the light of utilizing these hybrid thin film materials for applications in LEDs, photodetectors, sensors and thermoelectrics.

Keywords: Colloidal nanoparticles; hybrid nanomaterials; Optoelectronics

References

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