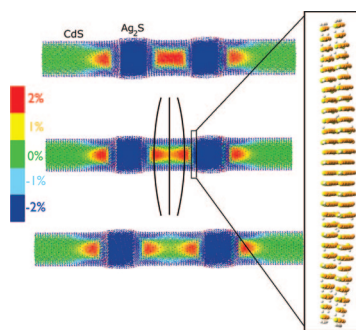


## Onward and Upward for Nanorod Superlattices

■ One-dimensional superlattices are valued for their potential use in photonic and thermoelectric applications. Recently, Demchenko and colleagues created CdS-Ag<sub>2</sub>S superlattices by partially displacing Cd<sup>2+</sup> cations with Ag<sup>+</sup> in CdS nanorods, filling the nanorods with islands of Ag<sub>2</sub>S. Though this method spontaneously creates stable, well-ordered structures, little was known about the mechanism of formation and the elastic properties of the superlattices.

To investigate, Demchenko *et al.* (p 627) used experimental X-ray diffraction data to model these nanorod superlattices, deducing the lattice geometry for the epitaxial attachment of monoclinic Ag<sub>2</sub>S and wurtzite CdS. Calculating the

formation energy of the CdS-Ag<sub>2</sub>S interface, the researchers surmise that the initial stages of Ag<sub>2</sub>S nucleation and growth are dominated by the growth and intercalation of small islands of Ag<sub>2</sub>S into the nanorod interior as well as smaller islands of Ag<sub>2</sub>S being absorbed by larger ones. As a limited number of Ag<sup>+</sup> ions diffuse into the structure, the Ag<sub>2</sub>S islands condense into several segments within the CdS nanorods. Though this diffusion-limited growth accounts for some of the

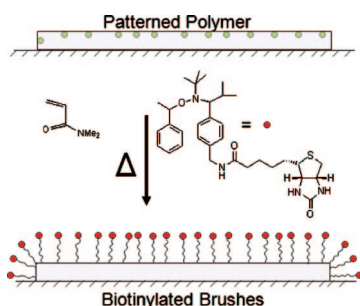


ordering, the researchers found that it cannot alone explain the structural periodicity. Additional calculations show that epitaxial attachment of Ag<sub>2</sub>S and CdS in the nanorod leads to significant amounts of strain due to a substantial lattice mismatch, re-

sulting in elastic repulsion between neighboring Ag<sub>2</sub>S segments. The authors note that these factors work together to create the well-ordered superlattice and may be in play in a variety of other epitaxially grown nanocrystal nanostructures.

## Radical Idea: Nitroxide Exchange Functionalizes Polymer Brushes

■ Patterning biomolecules on surfaces is a pivotal part of developing cellular biosensors, biomaterials, and genomic arrays. One useful patterning technique is nanocontact molding, which affords precise control through surface modification and incorporation of reactive



functionality into patterned cross-linked polymers. Previously, studies have shown that interesting functionality can be obtained by incorporating inimers—compounds having both an initiator and monomer fragments—for free radical polymerization into a photopolymer matrix. Using controlled reactions with free radicals, it is possible to use embedded inimers to grow polymer brush surfaces on the imprinted material.

Using this approach, Jhaveri *et al.* (p 719) demonstrated nanocontact molding on a photopolymer containing an alkoxyamine-based inimer. The team used this substrate to generate free radicals to grow polymer brushes with functionalized groups containing

pyrene at the chain ends *via* a nitroxide exchange process. Fluorescence generated by these functional groups confirmed the ability to control the brush feature size and surface properties. Taking the experiment one step further, the team created polymer brushes with functionalized groups of biotin as end caps, for binding to the protein streptavidin. Fluorescence measurements showed that the protein attached to these end groups with high selectivity. The authors note that these experiments demonstrate the successful use of free radical exchange to functionalize the tips of polymer brushes, a technique that holds promise for patterning other biologically relevant materials at the nanoscale.

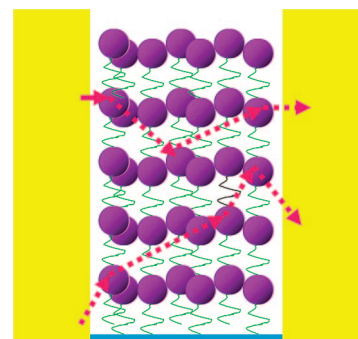
## Making Memories? Layered Films Show Potential for Electronic Memory Storage

■ Always on the quest to shrink electronic devices, particularly those for memory storage, researchers have investigated new materials with electron-transport and electron-storage properties suitable to reduce future electronic devices to nanoscale dimensions. One family of candidates for such materials are hybrid organic-inorganic ultrathin films based on polyoxometalates (POMs), compounds that can be envisioned as molecular metal-oxygen anionic clusters. Some groups have been especially interested in POMs with Keggin structures, which are notable because they can accept one or more electrons with-

out significant structural changes, delocalizing these electrons over several metal centers in their framework.

Interested in the properties and potential of novel POM-based thin films, Douvas *et al.* (p 733) used a layer-by-layer self-assembly method to fabricate hybrid thin films consisting of alternating layers of an anionic Keggin POM and a 12-carbon-chain cationic diamine. These formed discrete molecular layers that maintained an attraction through electrostatic interactions. Using information gathered from FTIR and UV spectroscopy in conjunction with XPS allowed the researchers to optimize the preparation of the thin films, including concentrations and pHs of the POM and diamine solutions and nature of the diamine solvent, to create a variety of reproducible single- and multilayered films. Further analyses of these films showed that their

electrical properties are a function of their structure. As such, the researchers note that these materials have the potential for tunable electrical properties, a characteristic that could make them attractive components for future memory device applications.



Published online April 22, 2008.  
10.1021/nn800192j CCC: \$40.75

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