Cover: *A collage of images from various contributions to this Special Issue of Advanced Materials is shown on the cover. Structures ranging from tetrapods, multiwall tubes, and belts to arrays of nanowires and nanorods, and vortexes in nanorod liquid crystals are represented. Cover design by Brian Mayers.*

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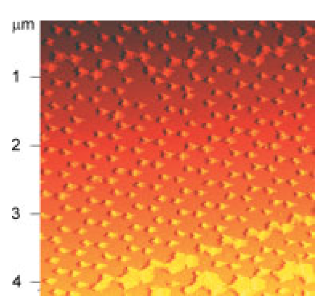
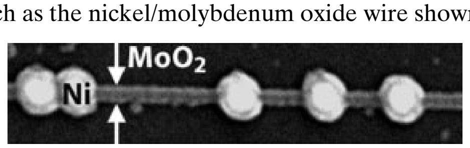
Guest Editorial

Review

Communications





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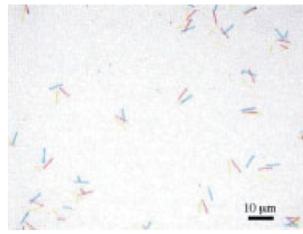
Communications

Surface diffusion coefficients (*D*) have been measured for gold nanorods suspended in water on planar gold substrates. The Figure shows the composite image of sequential optical micrographs at 15 s intervals. The variation of *D* is more dependent on rod length than predicted by the Stokes–Einstein equation, consistent with a frictional interaction between the rod and the surface.

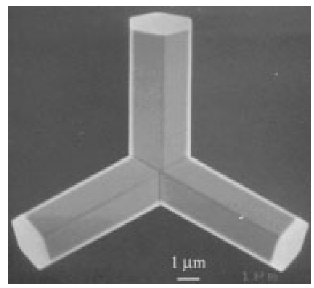


S. K. St. Angelo, C. C. Waraksa, T. E. Mallouk*

Adv. Mater. **2003**, *15*, 400 ... 402

Diffusion of Gold Nanorods on Chemically Functionalized Surfaces

The deterministic growth of different shapes of ZnO crystals from nanometer to micrometer scale is reported. Tetrapods (see Figure) and dendrites have been synthesized by simply adjusting the reaction temperature and the partial pressure of oxygen within the system. Size control of these structures can be achieved. ZnO nanoribbons are also easily accessible.

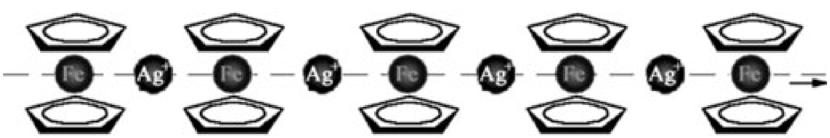


H. Yan, R. He, J. Pham, P. Yang*

Adv. Mater. **2003**, *15*, 402 ... 405

Morphogenesis of One-Dimensional ZnO Nano- and Microcrystals

A polymer-surfactant-assisted sandwiched reduction route to silver nanowires is described based on the sandwich organometallic compound (η^5-C_5H_5)$_2$Fe, in which there is obvious steric hindrance when the iron atoms reduce silver cations to elemental silver (see Figure), leading to a preferred direction. The formation of nanowires occurs in a layered solution with the assistance of poly(ethylene glycol).

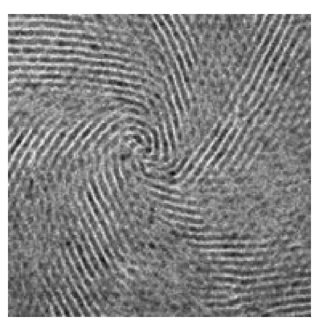


Y. Xiong, Y. Xie,* C. Wu, J. Yang, Z. Li, F. Xu

Adv. Mater. **2003**, *15*, 405 ... 408

Formation of Silver Nanowires Through a Sandwiched Reduction Process

The macroscopic alignment and superlattice structures of CdSe nanorods in a nematic liquid-crystalline (LC) phase are determined by the phases that form prior to complete solvent evaporation (e.g., vortex structures in linear arrays, see Figure). By controlling the phase of the LC solution and its orientation using pretreated surfaces or external fields, it may be possible to achieve fine control of order in deposited nanorod films.

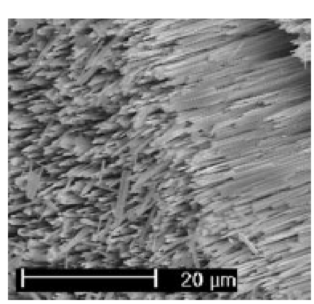


L.-S. Li, A. P. Alivisatos*

Adv. Mater. **2003**, *15*, 408 ... 411

Semiconductor Nanorod Liquid Crystals and Their Assembly on a Substrate

Very long and highly oriented potassium-doped tungsten oxide nanowires (see Figure) can be synthesized using the simple technique presented here. The mechanism of nanowire formation is investigated and a vapor–liquid–solid mechanism is proposed. This novel method can be easily scaled up and can also be extended to the preparation of nanowire arrays of other materials.



H. Qi, C. Wang, J. Liu*

Adv. Mater. **2003**, *15*, 411 ... 414

A Simple Method for the Synthesis of Highly Oriented Potassium-Doped Tungsten Oxide Nanowires

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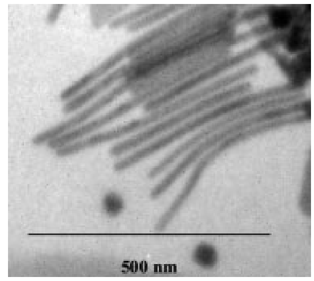
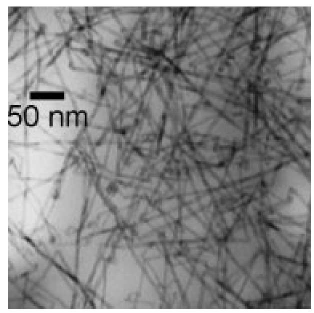
Communications

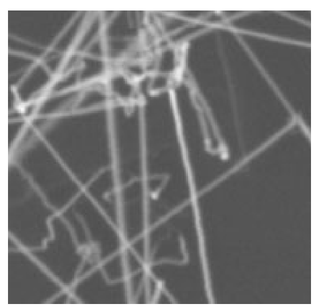
By using seed-mediation and careful control of pH, gold nanorods of high aspect ratio (~ 18–25, 20 in the Figure) have been produced by surfactant-directed synthesis. The yield is high (~ 90 %) and the method can be readily adapted for scaling up.



GaAs nanowires exhibiting narrow diameter distributions and small diameters within and near the strong-confinement regime can be generated using the solution–liquid–solid (SLS) mechanism (see Figure for 5.99 nm diameter wires). A relationship between the mean diameters of the nanowires and the indium catalyst nanoparticles from which the nanowires are grown is furthermore established.

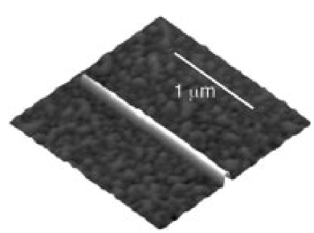


GaN nanowires with diameters in the quantum-confinement size regime (4–10 nm, ~10 nm in Figure) are prepared on large-area substrates through catalytic reaction of Ga and NH_3 in a hot-filament chemical vapor deposition system. The synthetic method is reproducible and could be applied to the growth of other semiconductor nanostructures.

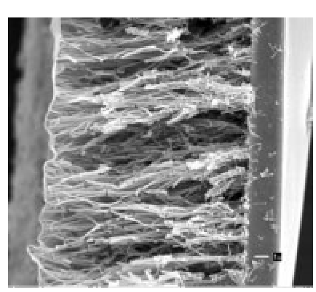


Research News

The synthesis and characterization of barium titanate nanowires are reported. Pristine nanowires have diameters ranging from 5 to 70 nm, (see Figure) lengths exceeding 10 μm, and perovskite structures with a principal axis aligned along the wire axis. Local non-volatile electric polarization can be induced and manipulated on nanowires as small as 10 nm in diameter.



The combination of sol–gel processing with electrophoretic deposition provides a new method for the growth of oxide nanorods. Both single metal oxide and complex oxide nanorods have been grown with uniform size (45–200 nm in diameter and 10 μm in length) and near-unidirectional alignment over large areas. The Figure shows TiO_2 nanorods ~ 180 nm in diameter.



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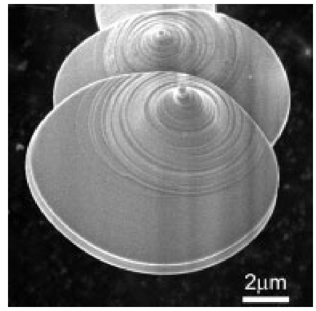
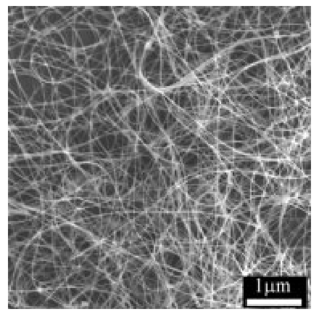
Research News

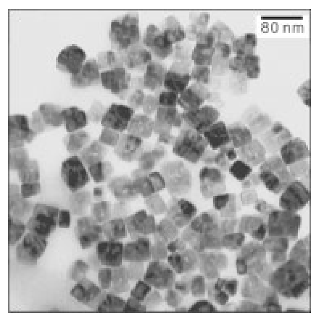
Novel nanostructures of semiconducting oxides are reviewed. It is shown that nanobelts, nanowires, and nanodiskettes (see Figure) of materials such as zinc oxide, gallium oxide, silica, and tin oxide can be fabricated using a vapor phase evaporation method. Two applications of these materials—in field-effect transistors and as gas sensors—are highlighted.



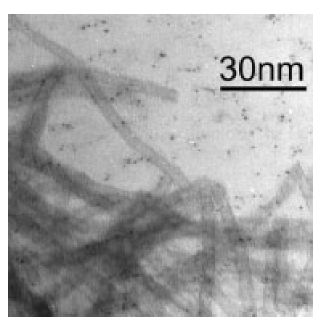
Semiconductor nanowires of silicon and germanium, 4–30 nm in diameter and micrometers in length, can be produced in high temperature supercritical fluids with more size control and higher product yields than are offered by gas phase vapor–liquid–solid (VLS) methods. Such nanowires (see Figure for crude product) are promising candidates for a variety of new technologies, including computing, memory, and sensor applications.



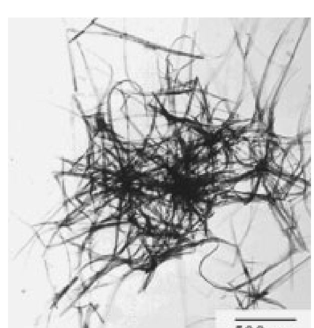
The shapes of novel nanocrystals, including 1D nanorods and the MnS nanocubes shown in the Figure, can be controlled by balancing parameters such as the nucleating seeds, kinetic control, temperature, and selective activation energy modulations of surfaces through the use of capping molecules. Here, the anisotropic structural evolution and key growth parameters for the shape control of various semiconductor nanocrystals is examined.



Lamellar surfactant–metal compound mesostructured materials are used as templates to prepare long-shaped metal nanostructures in a general procedure. Subsequent treatment of these composites by various methods produces nanostructures such as bismuth nanotubes (see Figure), or tungsten, copper, or cobalt nanowires.



The preparation of nanowires as long as 100 μm at low temperature is possible using solvothermal synthesis. Under the pressure generated by solvothermal reactions, the as-prepared nanowires are well crystallized. A variety of nanowire structures, including CdS–CdSe core–sheath nanowires and very long CdS nanowires, as well as the solvothermal closure of PbS nanowires, are discussed.



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