Scanning electron microscopy (SEM) imaging showed that most of the tin particles fall in the size range below 100 nm with fairly round shapes and a uniform distribution throughout the Li_2O matrix. "But apparently, there are still enough large tin particles to account for the rather narrow x-ray intensity peaks," said Wolfenstine. Electrical measurements resulted in curves for the jar milled composite and a SnO electrode that are very similar, but as expected the milled sample shows only little irreversible capacity loss. This indicates that the milling of Li_3N and SnO is a viable process for the formation of Sn/Li_2O nanocomposites that avoids the difficult milling of soft and ductile tin itself.

The researchers agree that there is still room for optimization "such as controlling the temperature during the milling process, adding an inert material such as Al_2O_3 or Li_2O to the starting materials before milling, or starting with a tin-oxide glass or tin-oxide composite glass" in an effort to achieve even smaller particle sizes.

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Rod-Shaped CdSe Nanocrystals Produced

To date, experimental nanocrystals fashioned from semiconductors have been shaped like dots or spheres. However, researchers at Lawrence Berkeley National Laboratory and the University of California—Berkeley have produced CdSe nanocrystals that are shaped like rods as reported in the March 2 issue of *Nature*.

"We have demonstrated that controlling the kinetics of semiconductor nanocrystal growth can be used to vary the shapes of the resulting particles from a nearly spherical morphology to a rod-like one," said Paul Alivisatos, the leader of the experimental team who holds a joint appointment with Berkeley Lab's Materials Sciences Division, and with the UC Berkeley Chemistry Department. "These rod-like semiconductor nanocrystals may prove advantageous in biological labeling experiments and as chromophores in light-emitting diodes."

By carefully maintaining a relatively fast rate of growth in the right mix of surfactant, the researchers could induce crystals of a selected size to assume an elongated rod-like faceted shape that maximized crystal surface area. Subsequent tests showed that these rod-shaped nanocrystals emit light that is polarized along their long-axis in contrast to the nonpolarized light fluoresced by cadmium-selenide nanocrystal dots.

"Polarized emission along the long axis of these rods should be in biological tagging experiments where the orientation of the tag needs to be determined," said Alivisatos.

Other tests showed that the gap between emission and absorption energies is larger for nanocrystal rods than for nanocrystal dots, which Alivisatos said should be an advantage in applications such as light-emitting diodes (LEDs) where the re-absorption of light can be a problem. It was also shown that the multiple rods could be packed and aligned, another advantage for both LEDs and for the use of these rods in photovoltaic cells.

Interactions of Synthesized Magmas Indicate the Importance of Chemical Reactions in the Formation of Volcanic Edifices

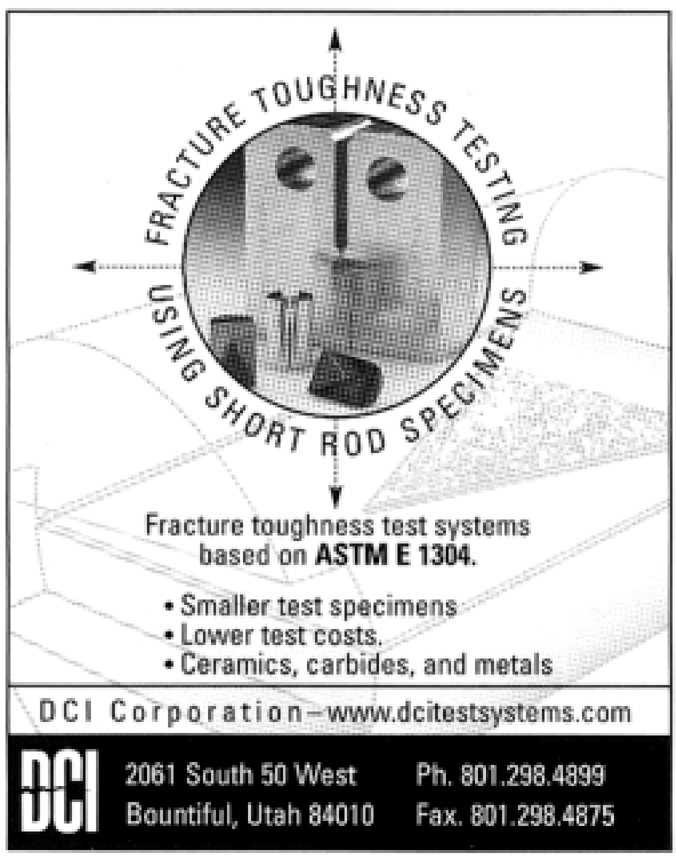
Recent experiments by Craig Lundstrom of the University of Illinois have shed light on how glassy materials are formed in exotic chunks of mantle called xenoliths, and how ascending magmas in the mantle can affect the lava output at Earth's surface through chemical, rather than thermal, reactions.

Lundstrom, a professor of geology, said, "Sodium in ascending magma can quickly diffuse into the surrounding mantle at lower pressures, fundamentally altering the process by which the mantle melts. Sodium infiltration can account for the creation of silica-rich glasses in xenoliths, and for the anomalous mineralogical composition of mantle found beneath mid-ocean ridges."

Xenoliths are pieces of mantle that get pulled off and are carried to the surface during a volcanic eruption. Within the xenoliths are former melts—now found as glasses—which differ radically from the magma that typically emanates from the mantle, basalt. The glasses reside between the two primary silicate minerals of the uppermost mantle, olivine and orthopyroxene.

"Xenoliths have been found in alkali-rich magmas from ocean island and continental volcanic settings worldwide," Lundstrom said. "But the origin of the glassy regions, and why they have peculiar elemental compositions, have been poorly understood."

As reported in the February 3 issue of *Nature*, to study the potential chemical interaction, Lundstrom first synthesized samples of magma found deep in the



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