Hierarchically Ordered Porous Oxides

Tech ID: 19996 / UC Case 1999-072-0

**BRIEF DESCRIPTION**

A low-cost, efficient method of preparing hierarchically ordered materials using non-toxic and biodegradable block copolymers.

**DESCRIPTION**

**Background:**

Currently, several approaches are available for the preparation of ordered structures at different length scales, most notably the nanoscale. Despite a wide variety of efforts in nanostructuring materials, the fabrication of hierarchically ordered structures at multiple length scales has remained an experimental challenge. Hierarchically ordered structures can be observed in some natural systems, such as diatoms, and materials of this nature are important for the study of structure-property relations as well as applications in various technologies. Previously, micromolding has been used to form patterned mesoporous materials, but these studies used acidic aqueous conditions to carry out the self-assembly of materials, which lead to limited processibility as well as the formation of non-continuous films.

**Description:**

Researchers at the University of California, Santa Barbara have developed a low-cost, efficient method of preparing hierarchically ordered materials using non-toxic and biodegradable block copolymers. Porous silica, niobia, and titania are prepared by combining micromolding, latex sphere templating, and cooperative assembly of inorganic species with amphiphilic block copolymers. The resulting materials show hierarchical ordering over several discrete and tunable length scales ranging from about 10 nm to several micrometers. Such materials are important both for systematic fundamental study of structure-property relationships and for their technological promise in applications such as catalysis, sensor arrays, waveguides, miniaturized electronic and magnetic devices, and photonic crystals with tunable band gaps.

**APPLICATIONS**

- Fuel cell membranes
- Electronic and magnetic devices

**PATENT STATUS**

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<td>United States Of America</td>
<td>Issued Patent</td>
<td>6,541,539</td>
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**ADDITIONAL TECHNOLOGIES BY THESE INVENTORS**

- Optimized Multiply-Functionalized Mesostructured Materials
- Tough, Self-Healing Silicone Materials
- Hybrid Supercapacitor and Battery System
- Nanoparticle Assembled Hollow Spheres
- Functionalized Inorganic Films For Ion Conduction