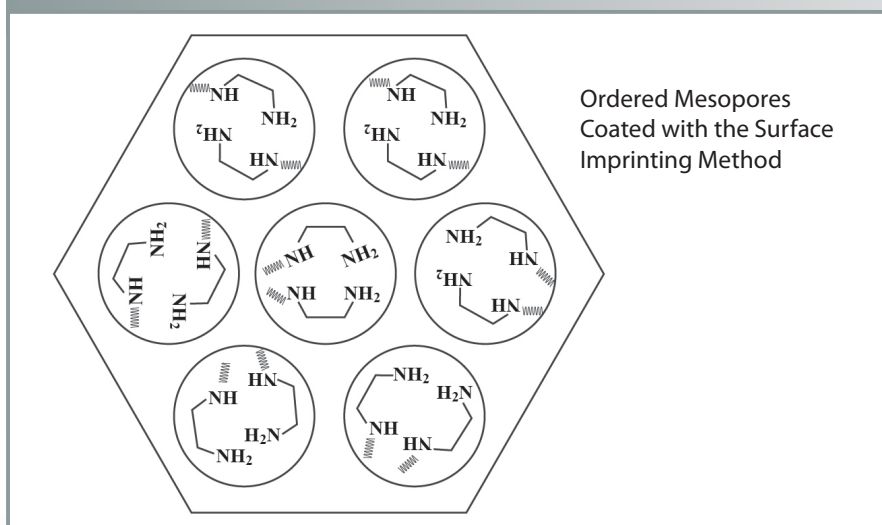


Imprinting Method for Selective Mesoporous Sorbents

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Technology Summary

An ORNL invention uses a unique molecular surface imprinting technique to make sorbent materials that can be tailored to target specific molecules. The mesoporous, ordered sorbents can sense, quantify, and remove toxic ions from effluents. The method offers a new class of chemical tools for industrial cleanup processes.

A major challenge facing mining and energy industries is the removal of toxic metal ions from process water or gas. The ORNL invention improves on existing technology by offering mesoporous sorbents that feature fast kinetics, high capacity, high selectivity, and molecule-specific capability. The invention can separate toxic metals from process effluents and detect and target amino acids, drugs, herbicides, and TNT in composites. Existing bulk molecular imprinting techniques have unfavorable process kinetics because the mass molecular transfer takes place through microporous channels. In addition, the cavities of conventional methods are extremely diverse, which reduces their ability to select target molecules.

The invention entails mixing a template molecule with an ordered mesoporous substrate. In solution, the template molecule binds to a bifunctional ligand in the substrate. When treated with an acid solution, evaporated, and titrated to a neutral pH, a highly tooled mesoporous sorbent results. The invention is a generic technique and can be applied to make solid-state sorbents for any toxic ion.

Advantages

- Fast kinetics, high capacity, high selectivity
- Wide-range capability to recognize specific molecules
- Generic technique for making sorbents

Potential Applications

- Toxic cleanup operations
- Separation of toxic metals from process effluents, paints, and other samples
- Detection of target molecules, such as amino acids, drugs, herbicides, fertilizers, and TNT
- Separation and/or detection of substances using chromatography, imaging agents, sensors, coatings, and composites
- Noble metal recovery

Patent

Sheng Dai, Mark C. Burleigh, and Yongsoo Shin, *Imprint-Coating Synthesis of Selective, Functionalized, Ordered Mesoporous Sorbents for Separation and Sensors*, U.S. Patent 6,251,280 B1, issued June 26, 2001.

Inventor Point of Contact

Sheng Dai
Chemical Sciences Division
Oak Ridge National Laboratory

Licensing Contact

Jennifer Tonzello Caldwell
Group Leader, Technology Commercialization
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865.574.4180
E-mail: caldwelljt@ornl.gov

