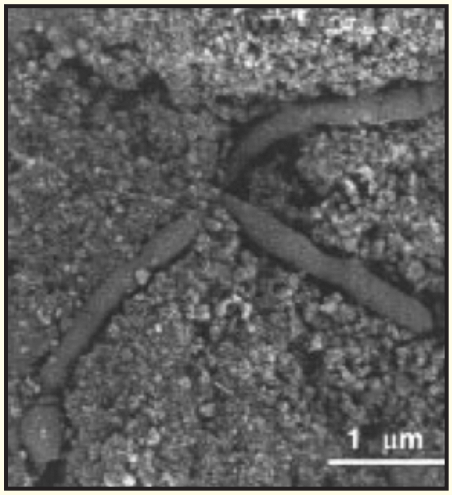
Bacterial Production of Mixed Metal Oxide Nanoparticles

UT-B ID 200501521



Technology Summary

Researchers at ORNL have developed a method for producing mixed metal oxide nanoparticles using anaerobic bacteria with an electron donor to reduce a metal oxide composition from a higher to a lower oxidation state. This method may be applied to cultures of a variety of metal-reducing bacteria to reduce the toxicity of dopant species to bacteria. In addition, the method provides a means by which bacteria with specifically tailored electron acceptors could facilitate research in bacterial respiration and metabolism.

A mixed metal oxide phase is prepared by the adsorption of at least one metal species onto the surface of a preexisting oxide of at least one other metal. A variety of metal species may be incorporated, provided this mixed oxide can be reduced by the bacteria. This invention provides a means by which the dopant species can be incorporated into the colloidal metal oxyhydroxide phase, resulting in a reduction in the toxicity of certain dopants to the bacteria.

The mixed metal oxide is then reduced to a lower oxidation state through the metabolic activity of the bacteria in combination with at least one electron donor to form a selected second mixed metal phase. The electron donor supports the respiration of the bacteria that culminates in the reduction of the mixed metal oxide. A crystalline product forms as reduction by the bacteria continues, and the dopant species is retained in the crystalline product.

Advantages

- Reduced toxicity of dopant species to bacteria
- Synthesis of desired particles based on the selection and tailoring of bacterial strains

Potential Applications

- Production of fine particulates of ceramic powders used by industry and in chemical processing applications

Patent

Tommy J. Phelps, Robert J. Lauf, Ji-Won Moon, and Yul Roh, *Fermentative Process for Making Inorganic Nanoparticles*, U.S. Patent 7,060,473, issued June 13, 2006.

Inventor Point of Contact

Tommy J. Phelps
Biosciences Division
Oak Ridge National Laboratory

Licensing Contact

Renae Speck
Senior Technology Commercialization Manager,
Biological and Environmental Sciences
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865.576.4680
E-mail: speckrr@ornl.gov

PARTNERSHIPS