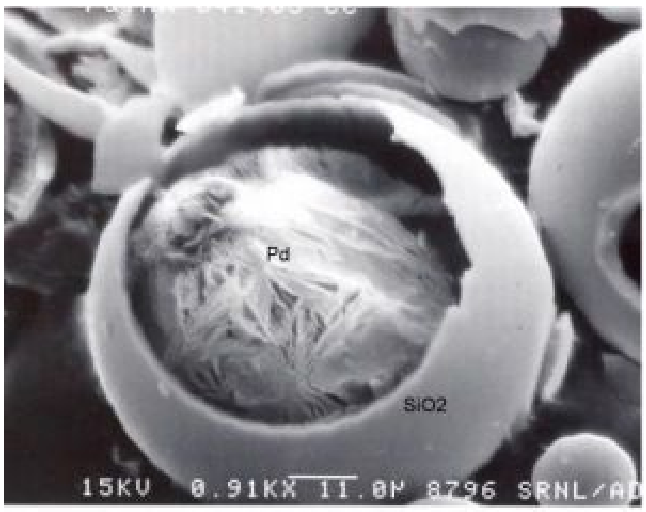
Microspheres to carry hydrogen, deliver drugs, filter gases and detect nuclear development

June 6 2008



SRNL researchers removed the top of a glass microsphere to show how palladium has easily passed through the sphere's pores and assembled itself into a new nanostructure. Credit: Savannah River National Lab, American Ceramic Society

What looks like a fertilized egg, flows like water, gets stuffed with catalysts and exotic nanostructures and may have the potential of making the current retail gasoline infrastructure compatible with hydrogen-based vehicles of the future – not to mention also contributing to arenas such as nuclear proliferation and global warming?

The answer is contained in the June issue of The Bulletin, the monthly magazine of The American Ceramic Society, which carries the first news of a never-before-seen class of materials and technology developed by scientists at the Savannah River National Laboratory.

This unique material, dubbed Porous Wall-Hollow Glass Microspheres (PW-HGM), consists of porous glass 'microballoons' that are smaller than the diameter of a human hair. The key characteristic of these 2-100 micron spheres is an interconnected porosity in their thin outer walls that can be produced and varied on a scale of 100 to 3,000 Angstroms.

SRNL Researchers G.G. Wicks, L.K. Heung, and R.F. Schumacher have been able to use these open channels to fill the microballons with gas absorbents and other materials. Hydrogen or other reactive gases can then enter the microspheres through the pores, creating a relatively safe, contained, solid-state storage system.

Photographs of these glass-absorbent composites also reveal that the wall porosity generates entirely new nano-structures.

Wicks, Heung and Schumacher have shown that the PW-HGM's permeable walls can be used for non-composite purposes, too. For example, the porosity can be altered and controlled in various ways that allow the spheres to filter mixed gas streams within a system.

Another feature of the microballoons is that their mechanical properties can be altered so they can be made to flow like a liquid. This suggests that an existing infrastructure that currently transports, stores and distributes liquids such as the existing gasoline distribution and retail network can be used. This property and their relative strength also make the PW-HGMs suitable for reuse and recycling.

The SRNL team is involved in more than a half dozen programs and collaborations involving the PW-HGMs in areas such as hydrogen storage in vehicles (Toyota), gas purification and separations, and even very diverse applications including abatement of global warming effects, improving lead-acid battery performance and nuclear non-proliferation. Applications such as the development of new drug delivery systems and MRI contrast agents are also blossoming in the medical field (Medical College of Georgia).

The full article can be downloaded at
www.ceramics.org/ASSETS/A9168B … D50C/06_08_Wicks.pdf

Source: The American Ceramics Society

Citation: Microspheres to carry hydrogen, deliver drugs, filter gases and detect nuclear development (2008, June 6) retrieved 26 April 2024 from
https://phys.org/news/2008-06-microspheres-hydrogen-drugs-filter-gases.html