

Nanocrystals Key to Better Fuel Cells

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A new way to make cubic zirconia with very small crystal sizes could be key to making hydrogen fuel cells more reliable and cost-effective.

The invention by a team led by Zuhair Munir, distinguished professor of chemical engineering and materials science at UC Davis, was recently included in Nanotech Briefs magazine's Nano50 awards for 2007. The awards recognize technologies, products and people most likely to impact the state of the art in nanotechnology.

Fuel cells combine hydrogen fuel and oxygen from the air to release energy, leaving only water as a waste product. Fuel cells could be an alternative power source for vehicles and other uses, but there are significant challenges to their widespread use. Current fuel cells run at temperatures of 1,500 to 1,800 degrees F (800 to 1,000 degrees C). Just reaching working temperature requires energy, and the heat quickly wears out metal, plastic and ceramic components. Prevailing fuel-cell designs also require an expensive platinum catalyst.

The new technology could allow fuel cells to run at much lower temperatures, 122 to 212 degrees F (50 to 100 degrees C).

Munir, Umberto Anselmi-Tamburini and Sangtae Kim at UC Davis invented a method to make oxides such as cubic zirconia (zirconium oxide) with extremely small grain sizes, on the order of 15 nanometers. A nanometer is one-billionth of a meter, or the size of a few atoms. At that scale, the crystals conduct electricity very well, through the movement of protons. The material could be used in fuel cells that are

based on chemical oxides.

Munir was also recipient of the 2007 UC Davis Prize for Undergraduate Teaching and Scholarly Achievement. The prize includes a cash award of \$35,000, thought to be the largest of its kind in the nation.

A patent application has been filed for the technology. A paper describing the technique was published in the journal Applied Physics Letters last year. The Nano50 awards will be presented during the National Nano Engineering Conference in Boston, Nov. 14 and 15, 2007.

Source: University of California - Davis

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