Practical on-board hydrogen storage is goal of new Argonne research project

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Solving one of the biggest problems in commercialization of fuel-cell-powered automobiles is the goal of a new $1.88 million research project on on-board hydrogen storage at the U.S. Department of Energy's Argonne National Laboratory.

To be practical, researchers say, the hydrogen storage system must be able to hold enough of the fuel for a driving range of 300 miles before refilling; no current technology meets this goal within the constraints of allowable weight and volume for passenger cars.

The Argonne research will investigate nanostructured polymeric materials as hydrogen storage adsorbents. Developed through an earlier collaboration between Argonne and the University of Chicago, the new polymer adsorbent material has shown great promise in preliminary tests. The new project funded by DOE will seek further improvements in storage capacity and an in-depth understanding of hydrogen-polymer interactions.

"The successful outcome of the project will lead to a low-cost, high-capacity hydrogen storage material that can be mass-produced within the existing industrial infrastructure," said Di-Jia Liu, Argonne scientist who is leading the research project.

Hydrogen is regarded as a future clean fuel replacement for gasoline. However, current hydrogen storage technology, as a high-pressure compressed gas or as a liquid at very low temperatures, does not

adequately meet all the requirements for the automotive application.

A suitable hydrogen adsorbent will work at low pressures with enhanced capacity, Liu said. The polymer materials under investigation by Argonne-University of Chicago team have the potential to adsorb hydrogen without breaking its bond, a process called "physisorption." Preliminary tests of the material have demonstrated "encouraging hydrogen storage capacity, reversibility and stability," he said.

The research effort includes Argonne chemists Liu, Martha Finck and postdoctoral researcher Junbing Yang of the Chemical Engineering Division, theorist Peter Zapol of the Materials Science Division, physicist Peter Chupas of the Advanced Photon Source, and Professor Luping Yu's research group at the University of Chicago.

"This project," Liu said, "brings together experts from different disciplines, ranging from basic sciences to applied technology. Our hope is that through such close interaction, we would be able to develop the best possible materials with the support of fundamental understanding of hydrogen storage chemistry."

Source: Argonne National Laboratory

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