Is hydrogen a viable fuel alternative?

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Hydrogen is the most abundant element in the universe, and a research investigator at the University of Missouri-Rolla has received a $300,000 grant from the U.S. Department of Energy to study how it might one day replace the gasoline in your vehicle's tank.

Unfortunately, it's not as easy as filling up with water. With hydrogen gas, you either need huge tanks – the space shuttle utilizes hydrogen fuel – or dangerously high pressures, according to Dr. William Yelon, a senior research investigator at UMR's Materials Research Center.

Yelon is studying hydrides of elements like lithium and boron to see if they will yield a more user-friendly form of hydrogen. "We're going to study at what temperature does hydrogen come out of these compounds to produce 'hydrogen gas,'" he says. "Can we lower the temperature for release? Can we speed up the process?"

Yelon will use neutron scattering to view crystal structures at varying temperatures over varying times to see what reactions are going on. The study for the DOE will take three years.

"The path is far from clear," Yelon says. "It turns out that gasoline is a wonderful medium as a fuel source. Thirty miles to a gallon isn't bad. And you can transport gas in pipes and trucks."

But an increasing demand for fuel worldwide combined with a decreasing oil supply is driving the DOE's plan for a "hydrogen economy" as early as 2020. Although the problems are complex, Yelon ultimately envisions a vehicle refueling process similar to a propane exchange. He thinks hydrogen-based fuel canisters could be trucked to refueling centers, exchanged for depleted canisters, and then hauled off to be recycled.

Still, the hydrogen economy would depend on more than just hydrogen. "It is not the actual energy source; it is the storage medium," Yelon explains. "Where is the energy going to come from to release the hydrogen? Nuclear energy seems like the most plausible long-term scenario."

This future vehicle, which wouldn't produce any greenhouse emissions, would utilize nuclear energy and hydrogen instead of gas. The hydrogen would release an electron that would be used by fuel cells, instead of a conventional vehicle battery, to produce electricity for the motor. The only emission would be water.

"That's one scenario," Yelon says. "It is clear that fuel cells are a major component – future engines won't be run on combustion. It will be fuel cells and an electric motor."

Source: University of Missouri-Rolla

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