

Solid hydrogen fueled cars

Work at the Ames Laboratory could lead to emissions-free vehicles

All of us hope that the cars of the future will be powered by hydrogen. After all, when you burn hydrogen, instead of poisonous smoke coming from a vehicle's tailpipe, you get pure, clean, nonpolluting water. There's just one problem. Hydrogen is the lightest element in the universe. When used as a fuel, it has a very low energy density – way too low for it to serve as a good fuel for cars.

That is, unless the hydrogen were in solid form. Normally, hydrogen must be chilled to greater than -259°C before it turns into a solid. But there are ways to store hydrogen within solid materials – and at room temperature. Many researchers around the world are studying how to do just that. One of them is Vitalij Pecharsky, a senior scientist at the U.S. Department of Energy's Ames Laboratory.

Pecharsky and his Ames Lab team believe the best approach is to add as many hydrogen atoms as possible to special materials called complex metal hydrides.

These materials already contain 10 percent hydrogen by weight – a fairly large amount, given

hydrogen's light weight. However, the researchers hope that by using high-pressure hydrogen gas and other techniques, even more hydrogen atoms can be added.

Shake it all around

The scientists have developed a unique way to make their experimental fuel. First, different hydrides will be reduced to nanosized particles. Nanoparticles are extremely small. Each one measures just billionths of a meter across. The small size makes it easier to add the needed extra hydrogen atoms.

The fine powder mixture is next placed in a hardened steel container along with steel balls. The container is vigorously shaken. While the shaking occurs, highly pressurized hydrogen gas is pumped into the chamber. The high pressure forces gaseous hydrogen atoms to combine with the solid hydrides.

Years from now, the novel material created by this method could find its way to the fuel tank of your hydrogen-powered car, perhaps as a powder or even a solid, removable block. Once in the tank, it'll be warmed slightly. This will allow the



This experimental device could enable more hydrogen to be stored inside solid materials.

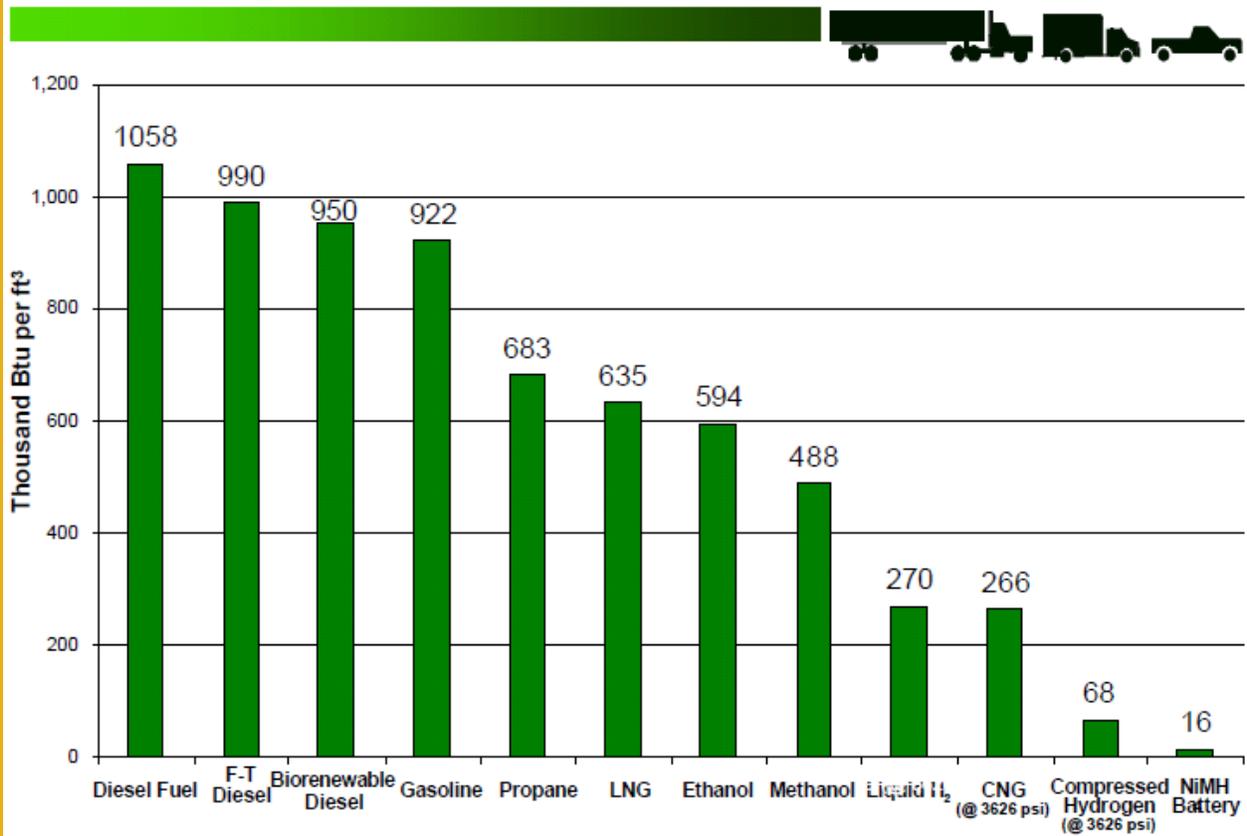


Someday, hydrogen filling-stations might become as common as gasoline stations today.

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Energy Density of Fuels



The energy we use to power vehicles and other devices can take many forms, and each form has a unique energy density. The denser the energy-producing substance, the more energy it produces in relation to its weight.

hydrogen atoms to be released in the form of a gas that may then be converted into electricity. The conversion could take place by using a fuel cell, or the hydrogen might simply be burned by the engine.

When the experimental fuel gives off most of its hydrogen atoms, it can be removed so new hydrogen atoms can be added – using the same

milling process – so the material may be used over and over again.

This recycling process might even take place right at the filling station. Alternately, you might exchange fuel tanks for your hydrogen car the way people now exchange propane cylinders for their gas barbeque grills.

As you can see, in the coming hydrogen age, a trip to the filling station could be a lot different than it is today. And when your tank is full, you can drive away powered by a non-polluting fuel that will never run out – thanks in part to the research taking place at the Ames Laboratory.