Hydrogen storage can be improved

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The storage of hydrogen in fuel cell powered cars can probably be greatly improved by increasing the working temperature of the fuel cell. With the use of magnesium powder, the storage of hydrogen can take place more efficiently and safely and at a higher temperature. This is the conclusion of Gijs Schimmel, who will defend his PhD thesis at TU Delft (Netherlands).

One of the main problems in the transition to a hydrogen economy is the storage of hydrogen, for use in vehicles, for example. Currently, this is done by storing the gas at high pressures or very low temperatures. Delft researcher, Gijs Schimmel, finds the high pressure option suitable for use in busses, "After all, on a bus there is space for a few high pressure cylinders. In cars this is not the case. Also, with such a tank, you are dealing with pressures of up to 350 bars, while in the case of LPG tanks, the pressure is restricted to 10 bars for safety reasons."

During his research at the Delft Institute for Sustainable Energy, Schimmel therefore studied the possibilities of the storage of hydrogen in powdered magnesium. Hydrogen storage in this kind of metal hydrides has been researched for a long time, but according to Schimmel, the problem remains that too much energy and too high a temperature is needed to extract the hydrogen from the compound, which negatively effects the efficiency of the process. Schimmel points out that an adjustment in the fuel cell itself may provide a solution. If the fuel cell were to work at a higher temperature than normal (between 200 and 300 °C in stead of 80 °C for most current fuel cells), then the ‘excess heat’ from the fuel cell could be used to efficiently extract

hydrogen from the storage tank.

In this way, the storage of hydrogen using magnesium powder could be a very interesting option. An additional advantage of a higher working temperature is that less deterioration of the catalysts takes place. The latter is also the reason that there is a great demand for new types of fuel cells. Schimmel is optimistic, “But like with many other developments involving hydrogen, it always remains to be seen whether the high expectations are met. If this idea works, a method and an infrastructure would also have to be developed to be able to ‘fill up’ on magnesium hydride.”

TU Delft scientists are also looking at completely different ways of storing hydrogen. One of these methods involves so-called gas hydrates, a kind of ice that can trap hydrogen. Recently Delft researchers showed that this can take place under relatively low pressures (less than 10 bars). Another related method is the possibility of storing hydrogen in carbon nano-tubes. However, in his research, Schimmel concluded that this method was probably not feasible.

Source: Delft University of Technology