Hydrogen fuel cell research paper

Environment, Nature

An arising problem in today’s world is the destruction of the ozone layer because of the emissions and harmful gases that vehicles are giving off. Forget ethanol or biodiesel. The next big thing in automotive fuel may very well be hydrogen. Automakers rapidly are closing in on making hydrogen fuel cell vehicles an everyday fact of life, with several test models set to debut over the next few years. Hydrogen fuel cells to power vehicles are desirable, experts say, because hydrogen is a renewable fuel that can be used to create electricity to run cars.

A chemical reaction between oxygen and hydrogen produces the electric power, and when pure hydrogen is used, the only emission from the tailpipe is harmless water vapor. Many people are asking, “ Why fuel cells? ” The gasoline engine in a conventional car is less than 20% efficient in converting the chemical energy in gasoline into power that moves the vehicle, under normal driving conditions. Hydrogen fuel cell vehicles, which use electric motors, are much more energy efficient and use 40-60 percent of membrane to the other side of the cell, the stream of negatively-charged electrons follows an external circuit to the cathode.

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This flow of electrons is electricity that can be used to do work, such as power a motor. On the other side of the cell, oxygen gas, typically drawn from the outside air, flows through channels to the cathode. When the electrons return from doing work, they react with oxygen and the hydrogen protons (which have moved through the membrane) at the cathode to form water. This union is an exothermic reaction, generating heat that can be

used outside the fuel cell. The future of hydrogen fuel-cell vehicles depends on advances in four areas: the hydrogen source, the distribution infrastructure, the on-board fuel tank and the on-board fuel cell.

Hydrogen must be made from carbon-free renewable sources before fuel-cell vehicles can make a dent in the climate problem. One idea is to make the hydrogen by splitting water using electricity from wind farms, or solar panels. Once the hydrogen is made, it must be distributed via special pipelines and tankers to an extensive network of hydrogen refueling stations, which have yet to be created yet. Once in the tank, fuel cell vehicles must store enough hydrogen to go several hundred kilometers between refueling stops.

Liquid hydrogen requires insulated tanks at -253*C. so most companies have chosen to compress the hydrogen inside high-strength carbon fiber tanks. The purpose of the fuel cell is to convert hydrogen to electric power. The challenge is to make it light, cheap, robust and durable — yet powerful enough to run the engine, lights and air conditioning. Hydrogen fuel cells, while about twice as efficient as internal-combustion engines using gas, cost nearly 100 times as much per unit of power produced, critics note. And hydrogen is explosive.

It ignites at a wider range of concentrations than natural gas and requires less energy to ignite, Michael D. Amiridis, chair of the chemical engineering department at the University of South Carolina, told the Web site and gas-electric hybrid cars advocate hybridcars. com. “ It’s scary – you cannot see the flame,” Amiridis said. Still, automakers are pushing ahead. “ What we

can do from our side is to show thattechnologyis mainly feasible, and we have many corporate projects in this area," said BMW's corporate communications manager Andreas Klugescheid.

It's North America Engineering and Emission Test Center in California, for example, has been testing two BMW Hydrogen 7 prototypes that run on both hydrogen and gasoline, using a dual-fuel engine and two separate fuel tanks. With the push of a button on its steering wheel, the Hydrogen 7 can run on either hydrogen or gasoline. It can go 125 miles on its hydrogen mode and 300 on its gasoline mode, thus limiting the possibility that its driver might be stranded, given that there's only one hydrogen filling station in California, near Los Angeles.

Along with the hydrogen fuel cells' high efficiency (from 40-70%), the possibility of utilizing both heat and electricity from them will make a significant contribution to reducing atmospheric emissions. For example, a fuel cell operating at 60% efficiency would emit 35-60% less CO2 at the fossil fuel stage and 80% less from hydrogen. Both GM and Honda are hoping to bypass concerns about the lack and cost of developing hydrogen filling stations by creating home hydrogen refueling devices that would allow cars to be refilled overnight in garages.

Much of the push for hydrogen fuel-cell vehicles is aimed at putting the public at ease through demonstration models and projects Energy sources of the future will have to be cleaner and more efficient than current sources - fuel cells fulfill these requirements. Several challenges remain before we will see wide-spread commercialization, mainly because of restrictions with size,

cost, reliability and safety, but an environmentally-friendly source of power is definitely on its way.