The Hydrogen Economy

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The Hydrogen Economy - Evaluation of the materials science and engineering issues

Hydrogen as a means for delivering energy to the point of need is most probably limited to its use in fuel cells. Fuel cells would convert hydrogen chemical energy into electricity; the only exhaust being water. Exploitation of hydrogen as a means for delivering energy to the point of application requires investment in materials, processes and infra structures. There will be risks. Materials need to be developed for safe storage and transport of liquid or pressurised hydrogen. Hydrogen storage tends to encourage metals to become brittle.

Overall, the energy density available from stored hydrogen is not great (stored methane or methanol would both be better but emit CO_2) so exploitation would require a change in economic drivers. Marketability would increase as fossil fuels become scarce but methanol can be made from agricultural feedstock's. Hydrogen must first be made in processes that consume a great deal of energy and which at present generate a great deal of CO_2. Generation with reduced CO_2 production could be based on nuclear or wind power.

Fuel cells convert hydrogen chemical energy to electrical energy. They have the potential to be used for transport e.g. fork lift trucks, golf carts, powered cycles but may be better adapted for powering electronic devices and power generation for isolated homes. This is the most likely area of development for the hydrogen economy.

Comment

The main barrier to the development of hydrogen as a fuel source is cost. It is not efficient to produce or transport except when it is made directly in situ from methanol or methane. Once in situ it is a very efficient source of electrical energy but not overall better than methanol.

Perceived risks from explosion are probably exaggerated even for unlikely applications such as a fuel for cars. The energy density of hydrogen is low and hydrogen disperses into the atmosphere very quickly.