Re: Hydrogen from nuclear heat

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- *From*: Rolf Martens <rolf.martens@xxxxxxxxx>
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Interesting info, Dave. Thank you for this.

Rolf M.
www.rolf−martens.com

In article <1172398467.811888.143100@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>,
dave.walters@xxxxxxxxxxx says...

> Hydrogen from nuclear heat
> [full: http://www.uic.com.au/nip73.htm]
>
> Several direct thermochemical processes are being developed for producing hydrogen from water. For economic production, high temperatures are required to ensure rapid throughput and high conversion efficiencies.
>
> In each of the leading thermochemical processes the high−temperature (800−1000°C), low−pressure endothermic (heat absorbing) decomposition of sulfuric acid produces oxygen and sulfur dioxide:
>
> H2SO4 ==> H2O + SO2 + 1/2O2
>
> There are then several possibilities. In the iodine−sulfur (IS) process iodine combines with the SO2 and water to produce hydrogen iodide which then dissociates to hydrogen and iodine. This is the Bunsen reaction and is exothermic, occurring at low temperature (120°C):
>
> I2 + SO2 + 2H2O ==> 2HI + H2SO4
>
> The HI then dissociates to hydrogen and iodine at about 350°C, endothermically:
>
> 2HI ==> H2 + I2
>
> This can deliver hydrogen at high pressure.

The net reaction is then:

$H_2O \Longrightarrow H_2 + 1/2O_2$

All the reagents other than water are recycled, there are no effluents.

The Japan Atomic Energy Authority (JAEA) has demonstrated laboratory−scale and bench−scale hydrogen production with the IS process, up to 30 litres/hr.

The Sandia National Laboratory in the USA and the French CEA are also developing the IS process with a view to using high−temperature reactors for it.

General Atomics' preliminary laboratory work on thermochemical production should be complete by 2006. A 10MW pilot hydrogen plant using fossil heat would then be built, followed by nuclear thermochemical production by 2015.

The economics of hydrogen production depend on the efficiency of the method used. The IS cycle coupled to a modular high temperature reactor is expected to produce hydrogen at $1.50 to $2.00 per kg. The oxygen by−product also has value.

For thermochemical processes an overall efficiency of greater than 50% is projected. Combined cycle plants producing both H_2 and electricity may reach efficiencies of 60%.

Production reactor requirements

High temperature − 750−1000°C, is required, though at 1000