Hydrogen production with Plasma-Steam Methane Reforming combined Technology for an automobile H-Station.

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Conventionally, SMR (Steam-Methane Reforming) is a well-known technique for producing a large amount of hydrogen in a steady-state manner. However, in the case of a hydrogen station for the automobiles, hydrogen production requires a technique of controlling the amount of production over time and producing hydrogen in a short period of time. If hydrogen is produced in a short time using plasma and stable supply of hydrogen is achieved by using SMR, hydrogen station can be economically operated.

Plasma for hydrogen production uses atmospheric pressure torch using microwave and produces hydrogen by supplying steam and methane. Hydrogen production time using plasma produces about 70% concentration within 5 minutes. SMR converts water vapor and methane into hydrogen using a nickel-based catalyst. In the case of SMR, the time required to produce hydrogen at 70% concentration is about 60 minutes, most of which is used to heat the catalyst to a certain temperature (700 ° C to 1000 ° C).

In this experiment, plasma and SMR combined process has been tested for the feasibility of applying the two technologies to the hydrogen station. 2.45 GHz microwave generator was used for plasma generation, and plasma power was applied up to 6 KW. The gas supplied was fixed at a steam flow rate of 45 g / min and the steam-carbon ratio was divided by 3.7 and 5.5. The catalyst used in the SMR process was model no. KATALCO 57-7 of Johnson Matthey Co.. In the plasma-only process, the production of hydrogen was possible in less than 3 minutes to produce about 50% hydrogen, and it took about 4 minutes to produce about 70% hydrogen. Also, when plasma and SMR process are used at the same time, it is possible to stably produce hydrogen with a concentration of 72% or more in about 8 minutes. In this experiment, it was confirmed by experiments that plasma and SMR bonding process significantly reduce the time required to stably produce hydrogen at a high concentration.