Advanced Syngas Manufacturing Process from Natural Gas with New Catalysts

1. Introduction

Nation-level approaches on a global scale for a society that uses hydrogen-based energy have been taken under the prevailing concerns for global environment and energy problems in recent years (**Fig. 1**). Hydrogen consumption is thus expected to expand in future.

Nippon Steel Corporation has been interested in the manufacture of syngas for producing fuels (FT diesel oil, methanol, etc.) that do not have high impacts on the environment, including the production of hydrogen from natural gas, and has been active in developing and commercializing gas manufacturing processes capable of operating at lower initial and running costs than conventional processes.

2. A Point

A steam reforming plant is particularly important in hydrogen production processes (**Fig. 2**), where raw material is loaded into a catalyst-filled reactor tube and heat is externally applied to the tube to accelerate the reaction. Excess steam used to be supplied to prevent carbon deposition on the catalyst during operation which led to the low energy efficiency and insufficient catalytic activity conventionally required the use of a large amount of catalyst. We are developing a unique catalyst with a higher catalytic activity and a lower carbon deposition characteristic and designing an optimum reforming process and equipment with the aim of higher heat efficiency and more compact reformer.

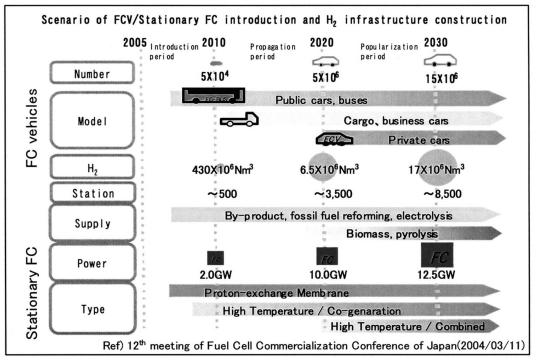

Fig. 1 Future image of hydrogen energy society

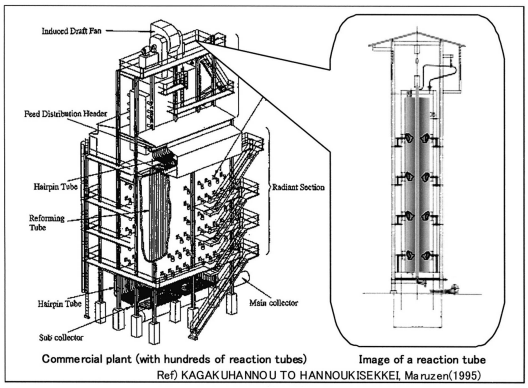

Fig. 2 An example of commercial steam reforming plant

3. Features

The catalyst under development by Nippon Steel Corporation features a nano-metal crystallization technique from host matrix which makes a catalytically active nano-size metal cluster from solid-solution compounds by out-filtration from the inside to precipitate them on the compound surface, as opposed to a conventional steam reforming catalyst which is produced with depositing the active metal on the catalyst carrier externally (**Fig. 3**). The optimization of the host compound, active metal and promoter using this technique can assure high catalytic activity with very low carbon deposition characteristic.

4. Development Example

The new catalyst, now undergoing evaluations of its basic performance at our laboratory, shows an amazingly low carbon deposition characteristic, and a high catalytic activity even under severe conditions, compared with a commercially available catalyst (**Fig. 4**). In long-run test operation, it also shows no decline in its activity, verifying its stable catalyst performance.

We are developing a process using this new catalyst, and we expect to check the advantage of our process through bench plant evaluation tests and to commercialize it in future.

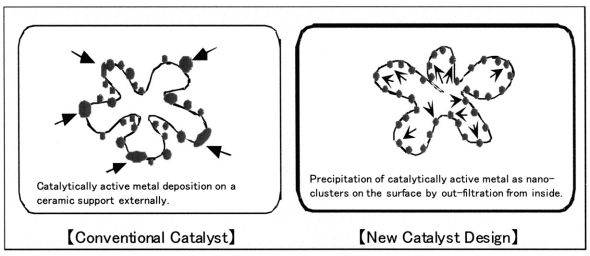

Fig. 3 Conceptual image of new catalyst design

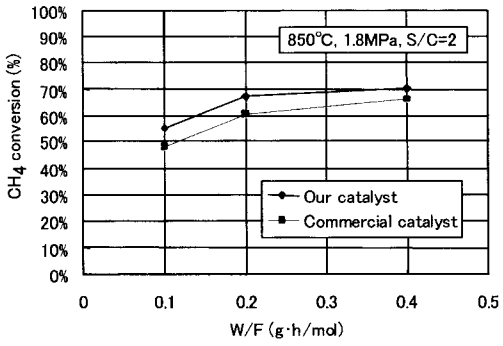

Fig. 4 Comparison of catalytic performance between our catalyst and commercial catalyst

For further information, contact
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