Catalyst Development for On-Site GTL Process Using Integrated Tool of *In-Situ* Surface Observation and HTS

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【Outline of survey】

Ultra clean fuels from unused dispersed carbon resources, such as remote gas, is one of the ultimate solution for trilemma of energy security, economy, and environment issues. GTL (Gas-To-Liquid) process, from methane in natural gas to transportation fuel via syngas (H_2 and CO mixture) and FT (Fischer-Tropsch) reaction, is most promising to produce clean transportation fuel. In order to establish the economic and compact GTL technology and the process on small-scale gas field, development of noble catalyst with extraordinary high activity and selectivity is essential. Specifically, both reforming catalyst for compact and low temperature syngas production, and FT catalyst to produce diesel fraction of liquid fuels with high selectivity, are the target of this project. The conventional methodology of catalyst development is ineffective for such high performance catalysts. In this project HTS (High Throughput Screening) method and *in-situ* observation technique are integrated to accelerate the development of the target catalyst. Using the target catalysts, a simple and economic GTL process on the site of unused dispersed carbon resources is expected with much contribution to remove the bottleneck of the 3E issues.

【Expected results】

Liquid fuels by the GTL process are sulfur-free and are available in the conventional infra-structure. The contribution to environmental issues is expected with the minimum "follow-on rounds". The fuels from unused remote gas field also contribute to guarantee the energy security of Japan. A new integrated tool of in-situ observation and HTS for high pressure and high temperature reactions, can be converted to catalyst development in other applications from the rapid discovery of "hits" to elucidation of the catalytic mechanism. The methodology of this project has ripple effects throughout the catalyst development because it can bridge the gap between catalyst design at molecule level and the specific catalyst preparation.

【References by the principal researcher】

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(2)Ming Jiang, Naoto Koizumi and Muneyoshi Yamada, Adsorption Properties of Iron and Iron-Manganese Catalysts Investigated by In-situ Diffuse Reflectance FTIR Spectroscopy, **Journal of Physical Chemistry B**, 104 (2000) 7636 - 7643.

【Term of project】 FY 2005 - 2009	【Budget allocation】 82,000,000 yen

【Homepage address】 http://www.che.tohoku.ac.jp/labo/Yamada/index-j.html