APPLICATION OF NANOTECHNOGY ON HYDROGEN PRODUCTION AND STORAGE IN KOREA

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ABSTRACT

In the era of fossil fuel shortage and soaring oil prices, and under the condition of severe environmental problems brought by consumption of fossil fuel, and increasing pressure for sustainable development, seeking for new energy as a substitute of fossil fuel has become an issue of great concern by our present world.

Hydrogen & fuel cell was selected as one of economy growth engine for next generation, and the Korean government set Hydrogen Economy Policy in 2005. There are four R&D programs on hydrogen and fuel cell in Korea. As one of those programs, Hydrogen Energy R&D Center is supported by MOST (Ministry of Science and Technology) and aims to do R&D works on the hydrogen production and storage.

Nanotechnology could be applied to enhance hydrogen production yields in various fields such as photochemical/photo electrochemical, thermo chemical or biological hydrogen production.

Also, hydrogen storage is considered as one of promising application areas of nanotechnology. In case of the type 4 cylinder for pressurized hydrogen storage, gas interrupting characteristic of polyethylene liner could be enhanced by using the clay nano particles. Complex metal hydrides such as alanate (AlH_4) materials have the potential for higher gravimetric hydrogen capacities in the operational window than simple metal hydrides. But, hydrogen release kinetics is too slow for vehicular applications, and application of nanotechnology will help to design and develop improved types of complex metal hydrides. Carbon based nano materials, MOFs, inorganic nanostructure materials with high porosity and surface area will be effective hydrogen storage materials. A team of scientists, headed by Korea Advanced Institute of Science and Technology professor Lee Huen, discovered an affordable way to store hydrogen in ice in April 2005. They found that water combined with organics creates a nano-space to stably store hydrogen at about 0 degrees Celsius, when water turns to ice. There are still lots of technical barriers in hydrogen production and storage, and nanotechnology will do an important role to overcome obstacles.