Study on Methods for Acquiring Natural Hydrogen from the Ocean Floor

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Expectations for utilization of natural hydrogen are recently growing. One of the fundamental mechanisms for natural hydrogen generation is serpentinization of mantle peridotite. Therefore, drilling into subsurface where serpentinization is not yet advanced and stimulating generation are the fundamental methods for hydrogen acquisition.
Although the hydrogen generation density per unit area is expected to increase based on drilling depth and length as a water supply and hydrogen recovery path for the serpentinization of peridotite, a large area for multiple drillings is required for practical hydrogen production. In Japan, securing such large areas without any environmental impacts for hydrogen production on land is expected to be a significant challenge.
On the other hand, in the oceans, Japan's exclusive economic zone (EEZ) ranks sixth in the world by area, that seems less environmental impacts offering a far larger drilling expanse than land is possible. Furthermore, accessing the mantle and/or mantle rocks exposed at the ocean floor may be relatively more feasible than on land. Exposure of mantle peridotite on the seafloor associated with a unique tectonic feature known as oceanic core complex is recently widely reported in the Philippine Sea within the Japan’ s EEZ.
Since serpentinization of mantle peridotite on the seafloor at water depths of 1,000 to 6,000 meters involves reaction with water, it is necessary to conduct prior technical studies on hydrogen recovery methods, such as collection and extraction, depending on the state of hydrogen generation, which is expected to vary significantly depending on local conditions, influenced by surrounding temperature and pressure, as well as the state of the hydrogen and the relationship between its generation volume and the amount and nature of reacting water.
This paper discusses the expected method for collecting, concentrating, and lifting up hydrogen to the sea surface in diverse forms within ocean areas.

Keywords: Natural Hydrogen, Mantl Peridotite, Ocean Floor, Hydrogen Recovery, Hydrogen Storage Material

