

## **Current Status of Deep-sea Mineral Resources Development in Japan**

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### **ABSTRACT**

In the early 1970's, an ocean mineral development was adopted as one of the Metal Mining policy in Japan. The Ministry of International Trade and Industry (MITI) requested the Metal Mining Agency of Japan (MMAJ) to explore manganese nodules in 1975. MMAJ has also started the exploration for hydrothermal deposits and cobalt rich manganese crust in mid 80's. The Agency of Industrial Science and Technology, MITI, started R&D of manganese nodule mining system in 1981 and will continue it until 1997. In the mean time the National Institute for Resources and Environment (NIRE) and the Geological Survey of Japan (GSJ) play important roles in the scientific and fundamental research of deep ocean resources development.

**KEY WORDS:** Deep-sea minerals, manganese nodules, deep-sea mining technology

### **1. Introduction**

Self-support ratio of rare metals in Japan is very low and the dependence on imports is 100% for cobalt, and 95% for manganese. The major exporting countries to Japan are limited to specific countries, reflecting the uneven distribution of production in the world. Within the demands for rare metals, the demand for nickel in the world rose by 3.2% on average every year over the past 30 years. However, 70% of this demand was concentrated in Japan, US and Europe, indicating that the demand by advanced industrial countries was very large.

Among of mineral resources found on the deep sea-bed, the mineral deposits that are attracting most interests are manganese nodules which are abundant at a depth of 4,000 to 6,000 m. As a result of the preliminary surveys in 1970's, the outline of their geological

distribution, chemical and physical characteristics, and formation process were clarified and their economic value as future expected resources was spotlighted.

The promotion of the surveys and the development of manganese nodules mining technology are very important for Japan in order to secure long-term stabilized supply of rare metals. On the other hand, the deep sea where manganese nodules are abundant is an extremely severe environment with hydrostatic pressures of 500 times of the atmospheric pressure and a temperature of 2 to 3 degree Celsius. Thus, there are many problems to be solved technically in this development, which needs large funding and a long lead time.

### **2. Japanese Program**

Since early 1970's a deep ocean minerals development was adopted as one of the government's principal mining policy. The Ocean Development Office of Agency of Natural Resources and Energy, Ministry of International Trade and Industry (MITI) is in charge of formulating basic policy for deep sea-bed mineral resources development. Then, the research institutes of MITI such as the Geological Survey of Japan (GSJ) and the National Institute for Resources and Environment (NIRE), have been playing important roles in the geological study and the fundamental engineering research of the deep sea-bed mineral resources development.

The Metal Mining Agency of Japan (MMAJ) has started the exploration of manganese nodules in the Clarion-Clipperton zone (C-C zone) in the Pacific Ocean in 1975 at the request of the MITI. For this project, R/V "Hakurei-maru" was launched. In 1980, R/V "Hakurei-maru No.2", which was designed specially for the exploration of deep sea-bed resources, was launched. As a results of these survey, Japan claimed exclusive exploration area in