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Challenges for the Production of Heavy Rare Earth Elements from Hard Rocks

Yasushi WATANABE*

*Institute for Geo-Resources and Environment, National Institute of Advanced Industrial Science and Technology, Higashi 1-1-1, Tsukuba, Ibaraki 305-8567, Japan
E-mail : y-watanabe@aist.go.jp
*Present address : Faculty of International Resource Sciences, Akita University, Mining Museum of Akita University, 28-2 Osawa, Tegata 010-8502, Japan
E-mail : y-watanabe@gipc.akita-u.ac.jp

Heavy rare earth elements (HREE) have been produced from ion-adsorption type deposits in southern China. Despite extremely low REE grades (0.2-0.05wt.%) of the deposits, exploitation of REE from this deposit type is very competitive because REE are easily extracted from the ores by ammonium sulfate solution. For the purpose of producing HREE outside China, a variety of sources are examined. They are 1) ion adsorption deposits outside China, 2) HREE-rich carbonatites, 3) alkaline rock complexes, 4) sediment-hosted phosphates associated with uranium mineralization, 5) xenotime associated with tin granites, and 6) iron-oxide apatite deposits. The major challenges for the production of HREE from these hard rock deposits are mineral beneficiation, REE extraction and treatment of radioactivity.

Key Words : Heavy rare earth elements, alkaline rocks, zirconium silicate, xenotime, apatite