Occurrences of REE phosphate minerals in the Mushgai Khudag deposit, Mongolia

Kenzo Sanematsu, Hideo Hirano and Yasushi Watanabe (GSJ, AIST)

The Mushgai Khudag REE deposit in southern Mongolia is characterized by apatite-magnetite mineralization, which occurs within the contact of syenite porphyry with host sedimentary rocks. The massive apatite-magnetite ore bodies consist mainly of apatite, celestite, Fe oxides, fluorite, gypsum, phlogopite and pyrite, locally accompanied by REE-rich dikes or veins. Identified REE-bearing minerals are apatite, monazite-(Ce) and probably rhabdophane. Monazite-(Ce) is the most dominant REE mineral, occurring along crystal boundary, crack and growth zone of apatite (mostly hydroxylapatite) crystals (Fig. 1). The REE-rich ores are characterized by the mineral assemblages of monazite-(Ce), hydroxylapatite, carbonates, pyrite and magnetite. This may suggest that high grade REE ores are formed by carbonatite magmatism. Apatite-magnetite mineralization is common in this deposit, whereas carbonate minerals derived from carbonatite are relatively scarce, suggesting that the occurrence of monazite-bearing high grade REE ores is not common.

Fig. 1 A backscattered electron image showing the occurrences of monazite-(Ce) and apatite in an apatite ore.