

The formation process of Jabal Tawlah REE deposit, Kingdom of Saudi Arabia

M. TAKAGI^{1*}, T. ECHIGO¹, Y. WATANABE¹, K. MONMA² AND R. MIYAWAKI²

¹Graduate School of International Resource Sciences, Akita University, Akita 010-0852, Japan
(correspondence: m6019112@s.akita-u.ac.jp)

²Dept. of Geology and Palaeontology, National Museum of Nature and Science, Ibaraki 305-0005, Japan

The Jabal Tawlah REE deposit is located in a northwestern part of Kingdom of Saudi Arabia. It is one of the small intrusive rocks associated with Jabal az Zuhd pluton, which is located about 10 km northwestern from the deposit. The deposit occurs as a laccolith, which is 300 m by 100 m in size, hosted in Precambrian sedimentary rocks. It is characterized by heavy rare earth elements (HREE) concentration (REE: ~5.1 wt%, Dy: ~3790 ppm).

Petrographic observation shows that the intrusive body at Jabal Tawlah consists of alkali-granite and syenite, and these rocks are affected by albitization. The alkali-granite is mainly composed of albite, K-feldspar and quartz, and the syenite of albite and K-feldspar. Mafic minerals are arfvedsonite and bioite but, those altered to chlorite. Accessory minerals in the syenite are dominated by zircon, with titanomagnetite, thorite, columbite [(Fe, Mn)NbO₆], fergusonite-(Y) (YNbO₄), xenotime-(Y) (YPO₄), waimirite-(Y) (YF₃), gagarinite-(Y) (NaCaYF₆), tveitite-(Y) [(Y,Na)₆(Ca,Na,REE)₁₂(Ca,Na)F₄₂], and fluorite. Among in these REE minerals, REE fluoride minerals are dominant.

The mineral paragenesis indicates that the original metasomatic fluid was extremely poor in Ca, resulting in precipitation of Ca-free yttrifluoride, waimirite-(Y). The increase of Ca-bearing yttrifluorides in the late paragenetic sequence suggests that Ca was supplied to the fluid by albitization with time. Alkali granite occurs in southern part of the deposit and syenite is in northern part and high Dy concentration is observed in the syenite suggesting that the northern part was exposed by high F contained hydrothermal fluids and HREE mineralization occurred in the syenite.