Mineralogy and geochemistry of the apatite vein type Mushgia Khudag REE deposit in Gobi, Mongolia

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We have studied the mineral composition and geochemistry of of the apatite vein type Mushgia Khudag REE deposit in southern Gobi, Mongolia. The rocks were studied in the field and in the laboratories of GTK Finland and CGL Mongolia by MLA, XRD, EMPA, XRF, and LA-MC-ICPMS. The studied sample material was collected during two field work periods in 2012 and 1014 for an ICI development project Chinggis II funded by the Ministry for Foreign Affairs of Finland (Yang, X. *et al.* 2015).

The Mushgia Khudag deposit is located in the southern parts of Gobi desert in the province of Ömnögovi some 600 km southwest of Ulaanbaatar. The REE mineralizations in the area are associated with apatite and carbonatite veins that range in width from centimetres to some tens of metres, and are genetically related to Early Cretaceous ca. 140 Ma syenite magmatism, (Munkhtsengel *et al.*, 2013). In the late stages of the igneous-hydrothermal activity the conditions of apatite crystallization were favourable for extreme enrichment of REE, leading to an average of 15% REO and the highest values reaching 21% REO in our apatite samples. To our knowledge, this is the highest content of REO reported in apatite worldwide. The average whole rock REE concentration in the studied samples is 8% of which around 97% is hosted by apatite, and the rest by monazite, monazite-(Ca), and REE-fluoro-carbonates, e.g., synchysite, and parisite.

In this work, the mineralogical and geochemical data are used along with field observations to interpret and characterize different ore forming events in the Mushgia Khudaga REE deposit. Especially, the conditions of apatite crystallization that brought about the extreme REE enrichment in this mineral are discussed.

References:

Munkhtsengel, B. *et al.*, 2013. Some notes on the Lugiin Gol, Mushgia Khudak and Bayan Khoshuu alkaline complexes, Southern Mongolia. International Journal of Geosciences 4, 1200-1214

Yang, X. et al., 2015. Mineralogy and beneficiation of vein-type apatite rare earth element ore from Mushgia Khudag, Mongolia. In: De Lima, I.B. and Filho, W.L. (eds.) Rare Earths Industry. Technological, Economic, and Environmental Implications. Elsevier, Amsterdam, Netherlands, pp. 377-39