

## Sources and perspectives of REE in the Lovozero massif (Kola Peninsula, Russia)

V. Zaitsev and L. Kogarko

Vernadsky Institute of Geochemistry and Analytical Chemistry, Geokhimiya, Moscow, Russian Federation  
(va\_zaitsev@inbox.ru, +7495 9382054)

Rare earth elements (REE) are essential to industrial production, firstly for clean energy options: wind turbines, electric vehicles, and energy-efficient lighting, as well as for oil conversion.

At this moment in Russia rare metal elements are extracted only from the Lovozero deposit. Annual production of Lovozersky mine is about six thousand tons of loparite (30-35%  $\text{REE}_2\text{O}_3$ , 8-12 %  $\text{Nb}_2\text{O}_5$  and 0,6-0,8%  $\text{Ta}_2\text{O}_5$ ). Annually Solikamsk Magnesium Plant converts loparite to 1500-2500 tons of  $\text{REE}_2\text{O}_3$  [1]. Proropriions of REE in loparite are (28% La, 57,5% Ce, 3,8% Pr, 8,8% Nd )

It is planning to double the mining production by the year of 2015.

There are three additional perspectives to increase production of REE in Lovosero deposit:

1) Improvement of ore dressing process. One of the tailing products of Lovozersky mine is aegerine concentrate. Annual production of this tail 50000-60000 tons. Additional separation of this concentrate may produce up to 2000 tons of low-grade concentrate (~70% loparite), this concentrate contains 21.8%  $\text{REE}_2\text{O}_3$ , 7.88%  $\text{Nb}_2\text{O}_5$ , 0.59%  $\text{Ta}_2\text{O}_5$ .

2) Accessory apatite. Several technologies of REE extraction from apatite, phosphorus acid and phosphogypsum was recently proposed for apatite from Khibina deposits [2]. In contrast to Khibina apatite, containing ~1%  $\text{REE}_2\text{O}_3$ , apatite from Lovozero contains 5-6%  $\text{REE}_2\text{O}_3$ . Tails of loparite main contain 0.6-1% of  $\text{P}_2\text{O}_5$ , it correspond 1.6-2.4 % of apatite. Apatite may be extracted by floatation (products of experimental floatation contain 61-71% of apatite). Treatment of this apatite may provide 200-450 tons of  $\text{REE}_2\text{O}_3$ . The fractions of Nd, Sm and Gd in total REE of apatite is much higher regard to loparite.

3) Eudialyte. The perspective ore for Lovozero mine is loparite-eudialyte lujavrites from Alluaive mountain. Experimental dressing of this ore result in production of loparite concentrate and eudialite concentrate, containing 72% of eudialite. Several technologies of rare-metal separation from this concentrate were recently proposed. In contrast to loparite and apatite, REE form eudialyte enriched by  $\text{REE}_Y$ : Y (22%), Yb (2.3%), Er (2,4) Dy (4.4%), Gd (4%), 1.4% Eu

We believe that application of new production processes on the basis of Lovozero deposit can provide spectrum of REE products, specialized for different customers.

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### References

1. [http://smw.ucoz.ru/index/godovye\\_otchety/0-11](http://smw.ucoz.ru/index/godovye_otchety/0-11)
2. RZM 2011 Abstract volume.