

Boosting the recovery of rare earth elements

October 8 2014, by Olli Ernvall

VTT Technical Research Centre of Finland and the Ural Federal University will start a joint research project for boosting the recovery of rare earth elements. The exceptional magnetic and optical properties of earth metals are utilised among others in electronics and new energy and environmental technologies.

Rare earth [elements](#) are present in small quantities in many minerals, and are generally recovered during mining operations. Such elements are rare in the EU area, where they are categorised as critical raw materials. The main areas for production are China and the USA, while other potential areas under investigation include Greenland, Africa and Australia.

"Gypsum sediments and the industrial side streams generated by mining operations are currently of secondary consideration in terms of recovery. Their significance will nevertheless grow once we are able to recover the metals efficiently. This will also serve to reduce the harmful environmental impact of waste mountains," says Research Professor Pertti Koukkari from VTT.

The minerals in Finland found to contain [rare elements](#) are phosphate and carbonatite. Recovery has been investigated on several occasions in connection with the production of phosphate fertilisers. The bulk of [rare metals](#) entering the fertiliser process emerge as a constituent of phosphogypsum, a by-product generally stored at the municipal tip for the plant in question.

150–200 million tonnes of phosphogypsum produced

annually

At least 53 countries are known to retain gypsum mountains, while phosphogypsum is generated at the rate of 150-200 million tonnes per year.

The concentration of rare metals in phosphogypsum may be of the order of a few thousandths, placing it on a par with the concentration of gold in gold ore. Rare metal prices fluctuate dramatically, so that depending on the market situation some earth metals may acquire a value greater even than gold. Thus use of a low-cost separation method in the processing of waste gypsum may well be profitable in certain cases.

Phosphogypsum in Finland amounts to around 55 million tonnes, to which a further 1.5 million tonnes is added each year. Neodymium, erbium and europium are among the elements found in the Siilinjärvi deposit. These are used in powerful magnets, and as a blend component in optical fibres and optical amplifiers.

Finland and Russia begin research cooperation

Among those investigating the recovery of rare metals in Russia is the Ural Federal University in Ekaterinburg. The university possesses pilot-scale equipment designed to develop the recovery of rare metal compounds contained in phosphogypsum.

Provided by VTT Technical Research Centre of Finland

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