

EXTRACTION OF THALLIUM, THORIUM AND URANIUM FROM ESTONIAN PHOSPHORITE AND PHOSPHOGYPSUM USING ALIQUAT 336

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Estonian phosphorite ore contains in addition to lanthanides a significant amount of radioactive elements as thorium, uranium and toxic thallium. After phosphorite ore processing with sulphuric acid these elements remain mainly into phosphogypsum as hazardous waste. If these elements are not removed during processing, they will pose environmental threat. [1]

Extraction studies have shown, it is possible to separate exclusively thallium, thorium and uranium in strong nitric acid media using modified Aliquat 336 (*trioctylmethylammonium chloride*). Thus, it is possible to remove significantly radioactive and toxic elements from phosphorite ore and phosphogypsum before any other downstream process such as saponification for lanthanide extraction. It is also meaningful to investigate further processing possibilities of isolated radioactive elements.

Aliquat 336 extraction efficiency and selectivity is much dependent on pH of the media. Extraction efficiency of Aliquat 336 is higher in 7,5M nitric acid in comparison to concentrated acid.

	Uranium	Thorium	Thallium
Conc. HNO ₃	30%	51%	99%
7,5M HNO ₃	76%	93%	89%

Average efficiency of extraction of phosphogypsum and phosphorite ore at different HNO₃ concentration using Aliquat 336. All extraction efficiency data are presented in %.

Measurements were performed using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS).

References

1. Li Kaizhong, Liu Huiping, Lai Fuguo, Xiao Yanfei, Hu Yongmei, Wang Chao, Xu Haibo. Migration of natural radionuclides in the extraction process of the ionadsorption type rare earths ore. Hydrometallurgy 171 (2017) 236–244.



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