

Extraction and Isolation of Rare Earth Elements from Phosphate Mining Waste Products

Large quantities of waste produced by the phosphate fertilizer industry are perceived to have minimal market value and represent significant disposal and storage problems. There have been several reports that many of these waste products contain varying amounts of uranium and rare earth elements. Given the high cost of rare earth element and uranium ore mining, attention has turned to the use of technogenic sources to obtain these materials. To date, an efficient and economically viable low environmental impact process to extract and recover rare earth and other elements, such as uranium, from phosphate fertilizer production waste products has not been reported.

Periodic Products Inc.'s patented Chelok[®] technology is a polymer-based chelating compound possessing multiple industrial applications. Applying our proprietary extraction technology and patented polymer-based metal isolation procedures, we have successfully isolated rare earth elements and uranium from phosphate amine tailings.

Element	Symbol	mg Metal / g Material (Max)	mg Metal / g Material (1st Wash)	mg Metal / g Material (2nd Wash)	mg Metal g Material (Total)	% Extraction	% Binding	% Recovery
Cerium	Ce	0.0250	0.0208	0.0008	0.0216	86%	97%	84%
Dysprosium	Dy	0.0031	0.0028	0.0002	0.0030	97%	82%	79%
Erbium	Er	0.0116	0.0084	0.0006	0.0090	78%	99%	77%
Europium	Eu	BLD	BLD	BLD	BLD	BLD	BLD	BLD
Gadolinium	Gd	0.0034	0.0030	0.0001	0.0031	91%	100%	91%
Holmium	Ho	0.0007	BLD	BLD	BLD	BLD	BLD	BLD
Lanthanum	La	0.0166	0.0141	0.0006	0.0147	89%	94%	83%
Lutetium	Lu	BLD	BLD	BLD	BLD	BLD	BLD	BLD
Neodymium	Nd	0.0169	0.0144	0.0006	0.0150	89%	97%	86%
Praseodymium	Pr	0.0008	0.0007	0.0000	0.0007	88%	100%	88%
Samarium	Sm	0.0042	0.0033	0.0002	0.0035	83%	98%	82%
Scandium	Sc	0.0010	0.0010	0.0000	0.0010	100%	90%	90%
Terbium	Tb	0.0006	BLD	BLD	BLD	BLD	BLD	BLD
Yttrium	Y	0.0238	0.0181	0.0008	0.0189	79%	100%	79%
Uranium	U	0.0054	0.0051	0.0002	0.0053	98%	99%	97%

continued ►



It is estimated that the cost of extraction and isolation (including CAPX) is approximately 40% of the current market price for these metals, making this process economically viable.

For additional information, visit periodicproducts.com or contact:

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