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Simple Chemical Method for the Separation of Rare Earth Metals

Brief Description

The invention is a new targeted recycling strategy for separating neodymium and dysprosium from hard magnets.

INVENTOR

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STATE OF DEVELOPMENT

-Rare earth separation method demonstrated in laboratory
-Further developing process to minimize air sensitivity of compounds used in separation process

INTELLECTUAL PROPERTY

International PCT/US2015/042703 patent application pending

REFERENCE MEDIA

An Operationally Simple Method for Separating the Rare-Earth Elements Neodymium and Dysprosium" Bogart, J. A.; Lippincott, C. A.; Carroll, P. J.; Schelter, E. J. Angew. Chem. 2015, 54, 8222–8225.

DESIRED PARTNERSHIPS

existing company that separates rare earth metals and/or recycles elemental components of hard magnets

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Market Overview

Recycling of rare earth metals from finished products is one possible new source of rare earth metals; however, there is a shortage of simple chemical methods to enable recycling. Less than 1% of rare earths were recycled in 2011.

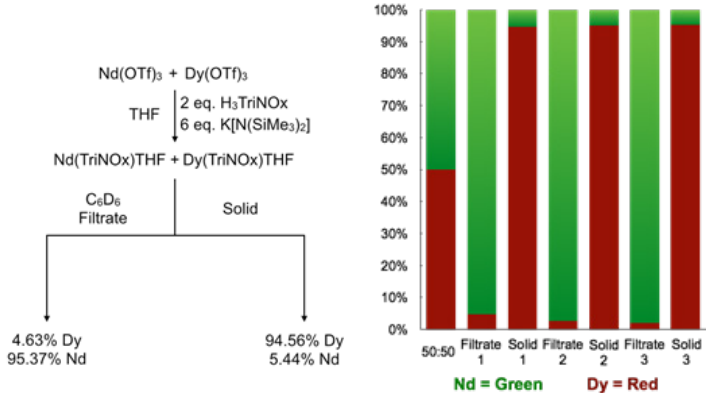
One of the most important uses of rare earth metals is in the manufacture of hard magnets. The most important and widely used rare earth magnet is neodymium iron boride: Nd2Fe14B (neo). In the manufacture of neo magnets, variable amounts of the element dysprosium (depending on need) are added to improve the performance of the material over a wider temperature range. Dysprosium is one of the scarcest and most valuable of the rare earth metals and, because of its use in high performance neo magnets, its price is predicted to rise by 2600% in the next 25 y.

The recycling of dysprosium and neodymium from hard magnets has been identified as a potential source for those elements in a recently published life cycle analysis. A key chemical problem for magnet recycling is the purification (separation) of dissolved Nd from dissolved Dy, following the chemically simpler removal of Fe and B. Current separations technology for rare earth metals uses counter current liquid-liquid extraction. This process is scalable, but is inefficient and requires significant initial capital investment.

Advantages

- Method to separate and purify the more valuable Dy away from Nd in mixtures using a simple chemical process without need for solvent extraction liquid-liquid separations
- Expect new process to enable magnet recycling because of lower capital investment due to replacement of liquid-liquid separation from current process

Schematic of the improved separations process of Nd and Dy (left) and bar graph showing the enrichment in RE at each separations cycle (right).



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