Cheap, Novel Process to Obtain Scandium from Red Mud with High Selectivity

A commercially viable, highly selective process for recovering Scandium from Jamaican Bauxite residue (red mud)

BACKGROUND

Red mud, an extremely alkaline by-product formed during extraction of aluminum from bauxite, is a serious environmental concern. One disaster that particularly stands out is the Ajka alumina plant accident in West Hungary: In 2010, the dam of one of the red mud reservoirs collapsed, leading to loss of life in the entire Marcal river. The toxic waste eventually reached the Danube, Europe’s second largest river, spurring countries located down the river to improvise countermeasures. Red mud contains a number of Rare Earth (RE) elements and trying to extract those is a smart way to mitigate the environmental threat it poses. Of all the RE elements, Scandium in particular has a high demand in the market; its high strength alloys are used in the aerospace and car industries. Constituting less than 1% by composition of red mud, the current extraction procedure – solvent extraction – is not very cost-effective due to the high cost of reagents.

A novel process invented in collaboration with the Center for Resource Recovery and Recycling (CR3) at WPI takes a different approach by selectively obtaining Scandium without extracting the more abundant Iron. The strategies used have improved separation selectivity and minimized reagent use at each step. What makes this process unique and marketable is its high selectivity, which leads to significant benefits in the cost profile.

Advantages:

- Cheaper and more selective than solvent extraction, the current state-of-the-art method to obtain Scandium.
- Environmentally friendly: reduces basicity of the red mud, thereby remediating the threats it poses to the environment.
- Indirectly helps aluminum companies, as they don’t have to worry about the toxic red mud sitting unused in holding ponds.
- Money made by selling Scandium oxide can drive red mud disposal.

SUMMARY

- Red mud, produced during extraction of aluminum from bauxite ore, is harmful to the environment. However, it’s a source of Rare Earth elements, particularly Scandium.
- Scandium has a huge demand in the market due to its applications in the aerospace and car industries.
- Current state-of-the-art extraction method is not cost-effective.
- Proposed process is more selective, cost-effective, and helps in remediating the dangers of red mud.