

Accepted Manuscript

Polyacrylonitrile-encapsulated amorphous zirconium phosphate composite adsorbent for Co, Nd and Dy separations

Junhua Xu, Sami Virolainen, Wenzhong Zhang, Jukka Kuva, Tuomo Sainio, Risto Koivula

PII: S1385-8947(18)31150-1
DOI: <https://doi.org/10.1016/j.cej.2018.06.112>
Reference: CEJ 19323

To appear in: *Chemical Engineering Journal*

Received Date: 29 March 2018
Revised Date: 8 June 2018
Accepted Date: 18 June 2018

Please cite this article as: J. Xu, S. Virolainen, W. Zhang, J. Kuva, T. Sainio, R. Koivula, Polyacrylonitrile-encapsulated amorphous zirconium phosphate composite adsorbent for Co, Nd and Dy separations, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.06.112>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Polyacrylonitrile-encapsulated amorphous zirconium phosphate composite adsorbent for Co, Nd and Dy separations

Junhua Xu¹, Sami Virolainen², Wenzhong Zhang¹, Jukka Kuva³, Tuomo Sainio², Risto Koivula¹

1) Department of Chemistry—Radiochemistry, P.O. Box 55, FI-00014 University of Helsinki, Finland

2) Department of Chemistry, Lappeenranta University of Technology, FI-53850 Lappeenranta, Finland

3) Geological Survey of Finland GTK, P.O. Box 96, FI-02150 Espoo, Finland

(Corresponding author's email: junhua.xu@helsinki.fi)

Abstract

Recycled Nd and Dy from the end-of-life NdFeB permanent magnet is an important supplement for the increasing demand of rare-earth elements. Thus, there is an urgent need to develop an environmentally friendly recycling method. Amorphous zirconium phosphate exhibits selective separation properties towards the ternary Co-Nd-Dy system, however, its powdery form limits development of scaled-up applications. We present an efficient amorphous ZrP/Polyacrylonitrile (am-ZrP/PAN) composite ion exchanger for uptake and separation of Nd, Dy and Co. The am-ZrP/PAN composite was synthesized and its structural, morphologic and acidic properties were investigated by various methods. X-ray tomography revealed rather evenly distributed am-ZrP in the PAN polymer matrix. The selectivity and ion-exchange kinetics of the am-ZrP/PAN composite were determined in relation to the individual elements. Due to dimethylformide (DMF) intercalation into the interlayer of ZrP, the uptake of Co, Nd and Dy increased 50% compared with that of the pristine am-ZrP. Column separation of Co, Nd and Dy from the Co-Nd-Dy ternary system was assessed by varying the feed concentration, loading degree, temperature, running speed and elution agent (HNO₃) concentration. Finally, gradient elution was employed for Co, Nd and Dy separation from a simulated ternary leachate. Fractions with 87.9% pure Co, 96.4% pure Nd and 40% pure Dy were collected through a single-column operation.

Download English Version:

<https://daneshyari.com/en/article/6578336>

Download Persian Version:

<https://daneshyari.com/article/6578336>

[Daneshyari.com](https://daneshyari.com)