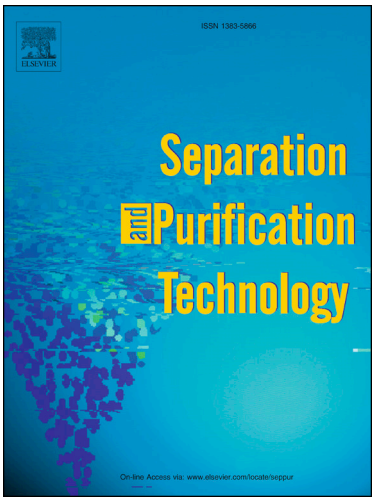

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PII: S1383-5866(17)32788-0
DOI: https://doi.org/10.1016/j.seppur.2017.10.052
Reference: SEPPUR 14134

To appear in: *Separation and Purification Technology*

Received Date: 27 August 2017
Revised Date: 26 October 2017
Accepted Date: 26 October 2017

Please cite this article as: D. Sun, M. Meng, Y. Qiao, Y. Zhao, Y. Yan, C. Li, Synthesis of Ion Imprinted Nanocomposite Membranes for Selective Adsorption of Lithium, *Separation and Purification Technology* (2017), doi: https://doi.org/10.1016/j.seppur.2017.10.052

Synthesis of Ion Imprinted Nanocomposite Membranes for Selective Adsorption of Lithium

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Abstract: The developmental ion imprinted nanocomposite membranes (IINcMs) had been achieved highly effective adsorption lithium from compound. Here, dopamine was introduced as surface-adherent material and hydrophilic Ag nanoparticles were deposited on the membrane surface to that integrate nanocomposite structure. More important, we investigated the selective adsorption capacity for lithium from high magnesium and low lithium. In this work, IINcMs presented relatively higher membrane flux value of 10.8 mL cm^{-2} min^{-1} and it possessed that the contact angle value was 67.746°, which indicated the fabricated membrane with high hydrophilicity that due to the presence of polydopamine (PDA) thin layer Ag nanoparticles on the IINcMs surface could enhance the interaction between membrane and water. Meanwhile, largely enhanced permselectivity (the permeation factor β values were 8.94) and structural stability (still maintained 92.1% of the maximum adsorption capacity after 10 cycling operations) had been successfully achieved, which should be attributing to the creation of uniform growth of PDA thin layer and Ag nanoparticles onto the porous membrane structure surface. Specifically, the as-prepared IINcMs also exhibited rapidly adsorption dynamics for lithium. Overall results suggest that dopamine and Ag nanoparticles can be considered as an effective additive for ion imprinted membranes in the adsorption of lithium. It is worth mentioning that IINcMs applied to selectively recognize and adsorb lithium, which was environmentally friendly without secondary pollution.

Keywords: Nanocomposites; Multilayer structure; Nanoparticles; Membrane adsorption; lithium

1. Introduction

With the rapid development of economy, lithium has been widely used in the aluminum production, metallurgy, pharmaceuticals industry and lithium ion battery industries [1-3]. The growing demand for lithium as an energy storage material has raised research interest on its recovery from salt lake brine for the past decades. However, the biggest difficulty in separating lithium ions is the characteristics of salt lake brine which bring with high magnesium and low lithium. Therefore, it is greatly necessary to adopt a rapid and specific method for effectively selective separation and enrichment of lithium from high magnesium.

Molecular imprinting technology (MIT) is regarded as an attractive approach to create specific recognition cavities chemically complementary and geometrically to