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An ion imprinted macroporous chitosan membrane for efficiently selective adsorption of dysprosium

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Abstract: A novel Dy³⁺ ion-imprinted membrane material (II-MAC) with interconnected 3D macroporous structure was firstly prepared by a simple immersion-precipitation-evaporation method for the selective solid-liquid extraction of Dy³⁺. The morphology and chemical structure of II-MAC were characterized using multiple physicochemical techniques, such as SEM, nitrogen adsorption/ desorption, FTIR, and element analysis. Adsorption experiments shown that the maximum adsorption capacity of II-MAC to Dy³⁺ was 23.3 mg g⁻¹ in the optimal pH (7.0) at 25 °C, and the value of imprint factor at pH = 7.0 was the highest. The distribution coefficient for Dy³⁺ in the presence of the competitive rare earth metal ions was 494.88 mL g⁻¹, which was remarkably higher than that of other ions. Moreover, II-MAC could be easily retrieved due to the membrane structure, which could tactfully avoid the complex centrifugation and greatly decrease the operation time. The reusability tests demonstrated that II-MAC could be repeatedly used without significant loss even after the fifth runs. This work not only provides a more straightforward and high-efficiency means in selective extraction of Dy³⁺, but also promotes the development of green and sustainable material.

Keywords: Chitosan, Dy³⁺, ion-imprinting, 3D macroporous membrane, selective adsorption

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