

Accepted Manuscript

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PII: S1385-8947(18)31749-2
DOI: <https://doi.org/10.1016/j.cej.2018.09.030>
Reference: CEJ 19869

To appear in: *Chemical Engineering Journal*

Received Date: 11 December 2017
Revised Date: 29 August 2018
Accepted Date: 6 September 2018

Please cite this article as: S. Marsousi, J. Karimi-Sabet, M. Ali Moosavian, Y. Amini, Liquid-liquid extraction of calcium using ionic liquids in spiral microfluidics, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.09.030>

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Liquid-liquid extraction of calcium using ionic liquids in spiral microfluidics

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Abstract

Using microfluidic systems in liquid-liquid extraction process has distinctive advantages, including lower consumption and high extraction efficiency. In this research, the separation of calcium metal ions from the aqueous phase is investigated by use of 1-Ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide (EMIM NTf₂) and 1-Butyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide (BMIM NTf₂) to enhance the performance of the liquid-liquid extraction. The main idea is to evaluate the geometrical effect of microchannel in the extraction efficiency. For this purpose, the spiral microchannel was constructed to induce the centrifugal force. Comprehensive parametric studies are done to reveal the effect of the main parameters on the extraction performance of the microfluidic device. At first, the effect of the alkyl chain of ionic liquids in the extraction efficiency is investigated. The results showed that the shorter length of the chain has the higher extraction efficiency. Then, the physical parameters such as calcium concentration, a crown ether concentration and the pH are optimized in the traditional extraction. The results of experiments show that the maximum extraction efficiency of 50% is achieved when the

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