

Accepted Manuscript

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PII: S1381-5148(14)00266-1

DOI: <http://dx.doi.org/10.1016/j.reactfunctpolym.2014.12.005>

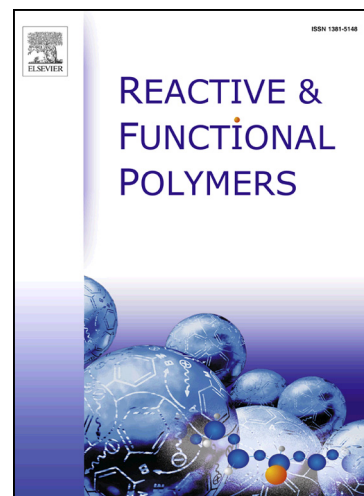
Reference: REACT 3478

To appear in: *Reactive & Functional Polymers*

Received Date: 7 January 2014

Revised Date: 31 October 2014

Accepted Date: 27 December 2014



Please cite this article as: M. Blahušíak, Š. Schlosser, J. Annus, Separation of butyric acid in fixed bed column with solvent impregnated resin containing ammonium ionic liquid, *Reactive & Functional Polymers* (2015), doi: <http://dx.doi.org/10.1016/j.reactfunctpolym.2014.12.005>

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Separation of butyric acid in fixed bed column with solvent impregnated resin containing ammonium ionic liquid

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Abstract

Batch equilibrium and fixed bed column extraction experiments for the extraction of butyric acid (BA) into solvent impregnated resin (SIR) have been done. Microporous Amberlite XAD-1180N was impregnated with an ammonium ionic liquid (IL) trialkylmethylammonium bis(2,4,4-trimethylpentyl)phosphinate. The BA extraction capacity isotherm has not a Langmuir type shape and no finite capacity was observed. The loading of the impregnated IL with the extracted BA at 37 °C is in agreement with the loading from L/L extraction equilibrium of BA at 25 °C. Capacity of freshly prepared SIR particles is superior to classical porous ion-exchangers. Both the temperature and the superficial velocity in column influence the shape of the breakthrough-curve in fixed bed extraction of BA using SIR. Sharpening of the breakthrough curve was observed with the increasing temperature and decreasing superficial velocity. Stripping with water is not efficient for the regeneration of the loaded column after extraction because of low concentration of the product acid in the obtained effluent. Higher BA concentration was achieved by stripping with 0.15 kmol.m⁻³ and 0.075 kmol.m⁻³ NaOH solutions. The combination of initial water stripping coupled with consecutive stripping by alkali can be beneficial for decreasing the consumption of chemicals and further processing of the product. After two extraction/stripping cycles, a stable capacity was achieved and sustained for 14 cycles, showing the possibility of long-term application of the prepared SIR in real technology.

Keywords: extraction, butyric acid, solvent impregnated resin, fixed bed column, ammonium ionic liquid

1. Introduction

Butyric acid (BA) has a number of applications in food, cosmetic and pharmaceutical industries and is a promising key-block chemical produced in biorefineries based on renewable resources [1-3]. Fermentative production of butyric acid suffers from the strong inhibition by the product [3-8], which is a general disadvantage typical for fermentative production of acids. This problem can be possibly solved by the separation of BA from the fermentation broth using extraction.

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