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Colloids and Surfaces A: Physicochem. Eng. Aspects 215 (2003) 67–76

COLLOIDS AND SURFACES A

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Facilitated transport of Fe^{III} and Cu^{II} ions through supported liquid membranes

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Received 17 April 2002; accepted 27 August 2002

Abstract

The factors that influence the transport of Fe^{III} and Cu^{II} ions from a source to a receiving aqueous phase separated by an hydrophobic phase immobilized in the pores of a microfiltration membrane, i.e. the transport through a supported liquid membrane (SLM), have been investigated. The experiments were performed by transferring the ions from a sulfuric acid solution (feed) into a phosphoric acid solution (strip) through an *n*-decanol solution of the carrier, di-2-ethylhexyl phosphoric acid (D2EHPA), supported on a PVDF membrane. The results show that the transport rate through the SLM of both the ions increases with the D2EHPA content in the organic phase, the iron transport being mainly influenced by the acid concentration in the feed and that of copper by the acid content of the strip. The selectivity of the separation decreases with an increase of the acid concentration in the feed and with the increase of the permeated fraction. The observed results are explained under the assumption that the transport of Fe^{III} is controlled by the diffusion of Fe–D2EHPA complex through the organic phase while the reaction with the carrier at the interface is the controlling step for the Cu^{II} transport.

Keywords: Membrane; Supported liquid membrane; Iron; Copper; Facilitated transport

1. Introduction

The application of liquid membranes (LMs) in the field of industrial separations could simplify the conventional liquid–liquid extraction process by reducing the two steps of extraction and back-extraction to one single step. Moreover, the membrane processes, because of their efficiency, selectivity, less use of solvent and lower operating costs, have a great potential for industrial applications, either as emulsion liquid membranes or as supported liquid membranes (SLMs). The latter are more easily applied for separation purposes and require smaller amounts of organic solvent.

Many researches in organic compound separations [1] and metallic ion recovery [2,3] have been carried out with SLMs either for industrial or for analytical purposes [4]. The most promising applications are in the field of separation of metallic ions, such as the removal of toxic ions from wastewater.

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0927-7757/02/$ - see front matter
PII: S0927-7757(02)00419-3