Electro-enhanced Ion Transport through Bulk-Liquid Membrane

Afagh Nasirian and Ali Reza Ghasvand*

Department of Chemistry, Lorestan University, Khoramabad, Iran

*E-mail: a_ghiasvand@yahoo.com

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DC potential-reinforced bulk-liquid membrane transport (PR-BLMT) was studied using Fe (II)-1,10-phenanthroline complex (Fe-Phen) as a model, for the first time. Indeed, this electro-enhanced ion transport study was performed by combination of the electro-membrane extraction (EME) and bulk-liquid membrane transport (BLMT). Iron (II) ions were transported from 3 mL aqueous solution (pH=4.3) into 1.5 mL of 1.0 M HNO₃ solution through 12 mL dichloromethane containing 5×10⁻³ M 1,10-phenanthroline. Ion transport was significantly improved by applying a DC voltage within the transport process. To maximize the transport, the important experimental variables including pH and volumes of donor and acceptor phases, ionic strength, type and volume of BLM, extraction time, DC potential, and type of electrode were studied. The results showed that exhaustive transport of Fe (II) ions through organic membrane was possible in the range of 0.2-27 µg mL⁻¹ (R²=0.998) with a relative standard deviation (RSD) of 3.5% (n=8). The applicability of the proposed PR-BLMT method to interfering matrices was evaluated by successful transport of Fe (II) ions in different real water samples.

Keywords: Electro-enhanced ion transport; Bulk-liquid membrane; Fe (II) ion; UV-Vis spectrophotometry.

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