Recovery of ionized nanosilver by emulsion liquid membrane process and parameters optimization using response surface methodology

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**ABSTRACT**

The discharge of silver ions from nanosilver-based product into the environment has raised the ecological and human health concern due to the toxicity of silver ion, particularly on the release behaviour of ionized nanosilver from the wastage. Therefore, recovery of ionized nanosilver is highly necessary. In this research, emulsion liquid membrane technique was employed for ionized nanosilver recovery from the domestic waste. The liquid membrane consists of kerosene, Span 80, Cyanex 302 and acidic thiourea as the diluent, surfactant, carrier and stripping agent, respectively. The emulsion stability was investigated at different surfactant concentrations, agitation and homogenizer speeds. Response surface methodology (RSM) was applied for the optimization of process variables including treat ratio, sulphuric acid (H\textsubscript{2}SO\textsubscript{4}) and thiourea concentration in the recovery process. The results showed that the most stable emulsion was observed at 3% w/v of surfactant, 10,000 and 150 rpm of homogenizer and agitation speed, respectively. The optimum conditions obtained for the recovery process using RSM were: treat ratio (0.256), H\textsubscript{2}SO\textsubscript{4} concentration (0.75 M) and thiourea concentration (0.85 M). At the optimized condition, the maximum recovery of ionized nanosilver was 84.74%.

**Keywords:** Recovery; Emulsion liquid membrane; Stability; Response surface methodology

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