Exploring Salting Out Phenomena in Air-Assisted Solvent Extraction of Cu

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Abstract

Air-assisted solvent extraction (AASX) has been introduced as an alternative method with a high potential for recovering metals from dilute solutions in alignment with sustainable development goals. This research investigates the effect of salting out using KCl, NaCl, $CaCl_2$, $NaNO_3$, and Na_2SO_4 on the efficiency of the AASX process (Cu recovery and organic phase recycling). This study uses thermodynamic coefficient and bubble size values to interpret the relationship between AASX efficiency results and ions present in the aqueous phase (type and concentration of electrolytes). It was observed that salting out up to the inhibition concentration increases bubble size and distribution while decreasing bubble coalescence. The trend of anion effects (from highest to lowest) on copper recovery and organic phase recycling was determined as NO^{3-}>SO_4^{2-}>Cl^- and SO_4^{2-} > Cl^- > NO_3^-, respectively. Also, it was found that bubble-specific surface area, the retention time of fluids in the column, and the proportion of uncoated organic phase play significant roles in this process. This research emphasizes the potential of establishing the AASX process for extracting copper from dilute solutions containing barrier anions and cations in various industries.

Keywords: Air-assisted solvent extraction; Electrolyte; Cu recovery; Continuous mode; Dilute solutions.

1 INTRODUCTION

Novel processes for the purification of dilute solutions, including air-assisted solvent extraction (AASX), membranes, and molecular recognition technology, have been introduced for extracting