Dissolved Nitrogen Predispersed Solvent Extraction innovative method for improvement the performance of solvent extraction equipments for dilute solutions

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ABSTRACT

Dissolved Nitrogen Predispersed Solvent Extraction (DNPDSE) is a new innovative method used to improve the performance of solvent extraction equipments especially for dilute solutions. In this method, two phase mixture operations are based on stitution of organic phase bubble dispersion instead of their drop dispersion in aqueous phase. This stitution causes until through increased contact area and enhanced buoyancy force for organic phase, in high aqueous/organic ratios, provide improved phase disengagement, less equilibrium time and higher extraction for metal ions. The results of experiments conducted on synthetic dilute copper solution (128 mg Cu/l) indicted that the amount of copper recovery in DNPDSE method compared with conventional SX method were increased to 22 percent (in average). This increasement in recovery is only due to the difference between the performance of DNPDSE and conventional SX methods, and copper ion flotation by cationic (DTAB) and anionic (NaDBS) surfactants is not involved in it.

Key words: Dissolved Nitrogen Predispersed Solvent Extraction (DNPDSE); Predispersed Solvent Extraction (PDSE); conventional SX; Bubble; Colloidal liquid aphron (CLA); Colloidal gas aphron (CGA); ion flotation.

1. Introduction

With the current trend in the world of modern industry and technology there is increased requirement for minerals, and mine productivity also increases to meet the demands. Therefore increasment in production of minerals as primary material used in industry gives rise to larger mines with a reduction of mineral percentage, and progress in technology demands using primary materials with more precise technical specifications. Decreased deposits of high purity ores and simple minerals have entailed extraction of low purity mines and complex minerals, and in addition, development of required equipment in mineral processing for high economic productivity has become more important.

Solvent extraction is one of the bases highly regarded in recent years in harmony with these technical developments. It is a continuous process used exclusively for clear solutions with maximum efficiency for dense solutions (Habashi, 2001). Hence reasons such as increased complexity of attaining charged solutions with proper concentrations (considerable increase in operating costs) and also production of large volumes of dilute currents containing heavy metals (with high processing costs for observing environmental standards) as a new source of valuable elements has provided for expansion of research activities in this sector with the aim of improved performance of equipment and increase of efficiency amount of them (especially for dilute solutions).

Froth flotoextraction, solvent extraction with bottom gas injection without moving parts, air-assisted solvent extraction, liquid membranes, nondispersive solvent extraction, microemulsions and reverse micelles, Predispersed Solvent Extraction and etc are examples of technologies developed for this reason in recent decades despite the fact that most of them have not reached industrial scales (Dibrov et all, 1998; Doungheethaveeratana et all, 1998; Rydberg et all, 2004; Sebba, 1912; Sohn et all, 1998; Tarkan et all, 2005; Tarkan et all 2006).

However, the results of such research activities have indicated that in case of satisfactory phase disengagement in high aqueous/organic (A/O) ratios with less equilibrium times and high extraction percentage for metal ions, the efficiency of this extraction method will considerably increase for dilute solutions (Tarkan et all, 2005).

Hence, with extensive researches conducted in both solvent extraction methods and various techniques for processing of dilute solutions, a new method called Dissolved Nitrogen Predispersed Solvent Extraction (DNPDSE) was invented. It is