The effect of nanobubbles on removal of Copper (II) from Wastewater by ion flotation

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The removal of Cu(II) copper from a dilute synthetic wastewater ( ) was studied by ion flotation at laboratory scale. Anionic sodium dodecyl sulfate (SDS) was used as a collector and ethanol as a frother.

Different parameters such as pH, collector and frother concentrations, foam height and bubble size distribution were tested to determine the optimum flotation conditions. The results showed that the more the foam height heightens, the more the metallic de-ionization occurs and the more the water recovery recedes.

To see into the effect of bubbles size distribution in this paper, a nano-microbubble generator was designed. Successfully Copper removal was obtained about 93% and water recovery 13% by using an intermixing method of coalescence phenomena (combined flotation by nano-microbubbles and by normal size bubbles generated mechanically) in A Denver type flotation machine, at low pH. The flotation time fell considerably at 37.5% when the bubble coalescence phenomenon was used.

To produce nano-bubbles, a nanobubbles generator system was designed by using the hydrodynamic cavitation method. This system consists of a glass cylinder of 20 cm inner diameter and 27 cm length, a static mixer, a peristaltic pump, a Venturi tube, pressure gauges, air flow-meter, Laser particle size analyzer 2000S from Malvern instruments, UK, and a computer set. When using this system, a portion of wastewater is pumped into venturi tube through peristaltic pump. A high liquid flow velocity within the Venturi tube produces a lowe (or negative) static pressure at that point (following Bernoulli's principle), and thus small (nano) bubbles form by cavitation.

Fig. 3 schematically shows nanobubble generating and sampling system for measuring the bubble size. Laser particle size analyzer equipment was used to measure the size distribution of bubbles generated by Venturi tube. It uses the principle of laser diffraction to analyze particles from 0.02 to 2000 micrometers in size in a time span of several minutes.

References


Figures

Fig. 1. Nano-microbubbles assisted flotation

Fig. 3. schematic of nano-microbubbles generator