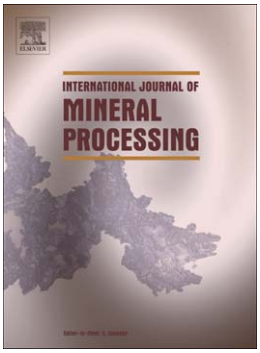

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A comparative study of methyl cyclohexanemethanol and methyl isobutyl carbinol as frother for coal flotation

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Abstract

Methyl isobutyl carbinol (MIBC), an aliphatic alcohol, is widely used as a frothing reagent in coal flotation but it has safety concerns owing to its low flash point (approximately 40 °C). In the present work, we studied a cyclic alcohol, methyl cyclohexanemethanol (MCHM) with a high flash point (approximately 110 °C) and compared its coal flotation performance with that of MIBC. A bottom-driven mechanical flotation cell and two coking coals of distinct floatability, namely A and B, were used. Collectorless flotation tests were carried out with process water for coal A. Flotation tests with diesel as collector at 50 ppm were carried out with simulated process water (0.03 M NaCl solution) and highly saline water (0.5 M NaCl solution), respectively, for coal B. The flotation results showed that MCHM was an effective alternative to MIBC. The highly saline water produced sufficient frothing, obviating the necessity of adding MIBC or MCHM. To understand the effect of frother type and concentration and NaCl concentration on the coal flotation performance, we conducted surface tension measurement for the frother solutions, characterised the dispersion of air near bubble sparger, and measured the stabilities of froth, foam, and foam film. It was found that MCHM was more surface active and more capable of stabilizing froth and foam than MIBC. Foam film stability measured at a broad range of interface approach velocity followed a bell-shaped trend and at a given NaCl concentration, the observed peak foam film stability of 15 ppm MCHM was higher than that of 15 ppm MIBC. Increasing NaCl concentration from 0.03 M to 0.5 M had the effect of stabilizing the froth and foam but destabilising the thin foam film.

Keywords: Coal cleaning, froth flotation, frother, MCHM, foam film