

# Interaction between MIBC and sodium metasilicate in flotation of slime coal

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## ABSTRACT

MIBC and sodium metasilicate are used as frother and dispersant in coal flotation respectively. It has been found MIBC is active not only on the air-water interface but also on the solid-water interface which results in an interaction between MIBC and sodium metasilicate. In order to study the interaction, flotation experiments were performed on coal fines (-150 $\mu$ ). The analysis of data showed if the frother (MIBC) dosage is excess of a certain limit, it has an activation effect on the gangue minerals associated with coal. In addition, it was found that sodium metasilicate can disperse clay slime and eliminates slime coating phenomenon but in the case of excess dosage, activation effect of MIBC can be intensified so that the minerals activation effect became more than the dispersion effect which is undesirable in coal flotation.

Keywords: Coal flotation, Sodium silicate, frother, dispersion, activation.

## INTRODUCTION

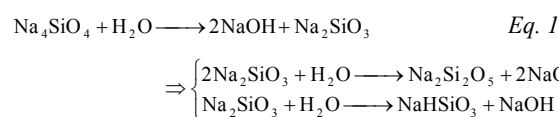
Froth flotation is the best method in beneficiation of slime coal (<150 $\mu$ ). Depression of coal particles and activation of mineral matter could so decrease flotation efficiency that the separation results are lower than washability curve of coarser size fractions ( $\approx 0.5$  or 1mm). Some of undesirable peripheral effects lead to this phenomenon such as *slime coating*, which is an important undesirable phenomenon reducing flotation performance.

Although both clay slimes and coal were commonly considered to carry an overall negative surface charge over a wide range of suspension pH, the slime coating is accrued due to electrostatic attraction between negatively charged coal particles and positively charged edges of clays (Xu et al, 2003).

It has been proven that frothers such as MIBC acts not only on the air-water interface but also on the solid-water interface and activates high-ash particles, especially at size fractions lower than 53 microns (Erol et al, 2003).

Use of an appropriate modifier could improve separation efficiency by dispersion of clay slimes. Sodium metasilicate could be a favorable modifier. Dissolution of sodium metasilicate is relatively complex and consists of its hydration and formation of NaOH, followed by dissolution of

silica. Sodium ortosilicate hydrolyses according to the equation 1 (Bulatovic, 2007)



Theoretically sodium silicate disperses particles with two mechanisms (Bulatovic, 2007):

- Dispersion due to presence of free poly silisic acid ( $\text{H}_{2x}\text{Si}_n\text{O}_{2n+x}$ ) which ionized partially; adsorption of poly silisic ions on the particle surface can increase negative charge and cause repulsion.
- Polymeric sodium silicate could be adsorbed on the particle surface and forms a hydrated layer on the surface. In the later mechanism, dispersion is justified by increase of negative charge and formation of hydrated layer on the particle surface

Addition of a polyelectrolyte such as sodium silicate results in ion exchange or ion adsorption on the surface of clay minerals so that increases negative charge and causes dispersion of clay slimes (PQ CORPORATION, 2009).