

Reverse flotation of diaspore from aluminosilicates by a new cationic organosilicon quaternary ammonium collector

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Abstract

The flotation of diaspore, kaolinite, pyrophyllite, illite and the diaspore-kaolinite mixture were studied with a new cationic organosilicon quaternary ammonium collector entitled QAS222. The acting mechanism of the collector with the four minerals was analyzed by Zeta potential measurement and FT-IR spectrum analysis. The results indicate that the QAS222 was effective in the reverse flotation of the diaspore-bauxite mixture of different Al_2O_3 -to- SiO_2 mass ratios (A/S ratio) at an optimum pulp pH of 11. The potentials of the four minerals increased when they were conditioned in the QAS222 solution; however, the potentials of the three aluminosilicate minerals increased faster than that of the diaspore, especially at $pH > 9$. Furthermore, they were positive in a wide pH range, indicating that QAS222 has a strong adsorption on the surface of the aluminosilicate minerals and thus that these minerals can be floated. The FT-IR spectra analysis further indicates that, besides electrostatic adsorptions, formation of the hydrogen bond and ammonium absorptions, chemical adsorptions occur between QAS222 and the aluminosilicate minerals, which allow for the QAS222 to be strongly adsorbed on the aluminosilicate minerals. However, these reactions between QAS222 and diaspore at pulp $pH=11$ are weaker than those of the aluminosilicate minerals. Thus, surface adsorptions cannot be formed effectively, resulting in reduced floatability.

Key words: Flotation, Bauxite, Collectors