

Effects of Crystal Structure and Surface Properties on Quartz Floatability

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Abstract: Cationic collector HAY and fatty acid collector GJBW were applied to investigate the natural floatability of quartz from Zhijin, Guizhou Province, China. Results show that collector HAY adsorbs on the surface of quartz more easily than fatty collector GJBW. Besides, the floatability of 2[#] is different from 1[#]. X-ray diffraction analysis, scanning electron microscopy with X-ray spectroscopy, and Zeta potential analysis tests were used to investigate the crystal structure and surface property of quartz. Result of X-ray diffraction analysis indicates that the composition and purity of two samples are simple. The crystallinity of samples is high. And the crystal grain size is large. The lattice parameters of the samples are similar with theoretical values, and larger. The change of cell parameter has effect on quartz floatability. Results of surface topography and elements distribution on the surface show some pits and obvious edges and corners. The aluminium and potassium are doped crystal structure of quartz in the form of isomorphic elements and interstitial impurity. Therefore, cationic collectors are more easily adsorbed on these places. The quartz is activated by traces of magnesium, aluminium and potassium on the surface of quartz. Result of Zeta potential test shows that the PZC (同前) of quartz is low. And these metal ions on the surface made the Zeta potential more negative. Through the test analysis above, it proves that the electronegativity of the quartz's surface is stronger. The floatation ratio was higher when the cationic collector was used under the condition of weak acid. The impurity elements may dope the crystal structure of quartz in the form of isomorphic. These elements have great effects on the floating properties of quartz.

Keywords: siliceous-calcareous phosphate; quartz; crystal structure; X-ray diffraction analysis; Scanning electron microscopy