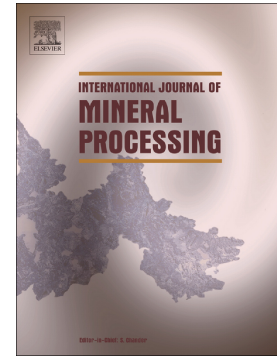


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Effect of design and operational parameters on particle morphology in ball mills

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Abstract

Different factors involving in grinding of ore cause various breakage mechanisms. These different mechanisms differ the morphology of ground particles. In this study, the effect of ball mill types, feed sizes, and ball surface area have been investigated on the morphology of ground quartz particles using MBL cruise optical microscope and Olympus E-510 camera. Measured two-dimensional particle projection was expressed mathematically such as circularity, roundness and aspect ratio by ImageJ software. More than 20000 particles were morphologically measured for image analysis. Results show that circularity and roundness of ground particles are enhanced in an ordinary ball mill equipped with smooth liner (OBM). While higher aspect ratio of ground particles are achieved in cylindrical ball mill equipped with wavy liner (CBM). Consequently, the dominant breakage mechanism for OBM and CBM are abrasion and impact, respectively. Circularity and roundness values of coarse-grained ground particles are more than fine-grained particles. The increase of ball surface area causes the increase of circularity as well as roundness values and the decrease of aspect ratio value.

Key words: Morphology, Circularity, Roundness, Aspect ratio, Ball mill, Breakage mechanism

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