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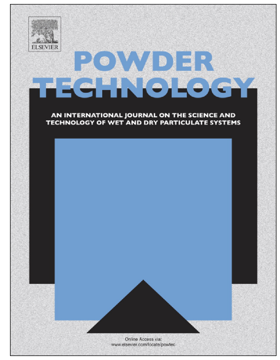

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Modeling and Simulation of Continuous Open Circuit Dry Grinding in a Pilot-Scale Ball Mill Using Austin´s and Nomura´s Models

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ABSTRACT

Prediction of continuous steady-state ball milling using the traditional population balance model requires knowledge of several functions, namely those describing the rate and distribution of breakage products, the mass transfer relationship between the mill hold-up and the discharge, the mode of transport within the mill, as well as the description of internal classification, whenever present. In spite of its long track record, there are comparatively few instances in which the population balance model of continuous ball milling has been validated in great detail under controlled conditions. The work analyzes how confidently one can predict continuous milling in a dry open-circuit pilot-scale operating under a wide range of feed rates, mill speeds, fillings and feed materials (an iron ore and a spent catalyst) using the population balance model. It relies on measured residence time distribution of the solids, the Austin model of grinding and the expressions recently proposed by Nomura to describe mass transfer from the mill to the discharge to predict continuous grinding. Breakage parameters of the materials studied were estimated on the basis of batch grinding tests. Parameters in Nomura's transport model were fitted on the basis of a few selected continuous tests and were used to estimate the mill hold up operating under a range of conditions. A comparison between experiments and predictions demonstrated that errors in the measurements of hold-up were, on the average, 6.0%, whereas those associated to the 80% passing size of the product were smaller than 5.6%.