Predicting and Modelling Bond work Index Using Chemistry (as a proxy for mineralogy)

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ABSTRACT

Geometallurgy advances the understanding of variability across an ore body through the integration of geology, mineralogy and processing response and therefore enhances spatial mapping of comminution or separation properties. Spatially extensive geometallurgical measurements are necessary so that continuous rock properties can be generated and used for the development of comminution and processing domains using geostatistical modelling. Standard testing protocol across geological and mineralogical domains is vital to understand the variability in deposit wide comminution and separation properties.

The high cost and large sample requirements associated with metallurgical test work typically results in insufficient data density and distribution, making it difficult to model and map deposit scale variability. Quantitative datasets such as EQUOtip and Sonic Velocity are useful to measure in situ rock hardness, however this data is typically either sparse or missing within advanced mining operations. In recent years, mineralogy and multi-element assay data has often been collected as part of the standard geological data set and is generally coincident with metallurgical test work.

In this paper relationships between mineralogy and comminution parameters have been applied to multi-element assay data with coincident measured Bond Work Index (BWi) data to generate a predicted BWi using linear regression. The predicted BWi is intended to supplement existing measured BWi data to enable better extrapolation across the deposit. Geostatistical Conditional Simulation methods have then used the predicted and measured BWi data to produce a BWi variable as a new input to the resource model. The simulated BWi can be used as an input for specific energy models to predict required grinding energy consumption across a deposit.