The Benefits of Using Geometallurgical Principles for Metallurgical Sample Selection

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Abstract

Metallurgical sampling and the results of metallurgical testwork form the quantitative basis for prediction of the processing behaviour of ore. These predictions are critical inputs for prediction of current and future performance in the operating plant, particularly when new orebodies are added to the production schedule.

Ore characteristics such as hardness, competency, mineral content, grain size and texture, control ore behaviour in a mineral processing circuit. Therefore, the principles for selection of metallurgical samples should be strongly guided by orebody geology. Furthermore, only a tiny fraction of the orebody will be tested before it is mined, so metallurgical testwork is always data-poor. In contrast, the geological sample database is likely to consist of tens or hundreds of thousands of records.

A key principle of geometallurgy is to use the geological sample database to gain leverage from relatively few high-cost metallurgical tests. Applying geometallurgical principles to design of metallurgical sampling programmes aligns sparse testwork data to abundant geological data and ensures that the data is suitable for the application of data science methods to derive robust predictions of ore processing behaviour.

We explore the selection of metallurgical samples through a geometallurgical lens. Before commissioning sampling or testwork the purpose of the testwork must be clear so that the right sample type is selected. The selection of composite, variability, and blended samples with respect to purpose, representivity, and application of test results is discussed. The vexed question of “how many samples do we need?” is addressed and an outcomes-based solution is proposed. Practical recommendations for managing a metallurgical sampling program and controlling the quality of the outputs are recommended and illustrated with a case study.