

Proxy Methods for Domaining Ore Deposits for Au Grain Size

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A critical aspect of geometallurgy is domaining ore deposits in properties relevant to processing performance. In low-grade Au deposits, a key parameter affecting gravity Au recovery is grain size. Two methods have been developed that can generate Au grain-size proxies suitable for domaining an orebody in terms of gravity recoverable Au. These methods are designed for application in deposits where some parts of the ore may be suitable for the gravity recovery of Au but the overall grain size of the Au is fine to medium (5-50- μm diameter).

Any small volume assay that can recognize one grain of gold can be used to provide a proxy for gold size. The most effective method given a trial was the handheld or portable XRF. Our measurements with a portable XRF (effective analysis area 32.5 mm², approximate penetration depth 0.1 mm) suggest single grains larger than 14 μm can be detected. We used 1200 analyses to represent 300 m of drill core; 190 analyses were above detection (DL = 5 ppm; 16% of analyses). Assuming 20% of the gold was not detected, the portable XRF data indicate 50% of the Au in this core interval is in grains over 17- μm diameter. This is very similar to the size distribution inferred from 690 cm² of BSE mapping of samples from the same core interval (50% of Au grains larger than 20 μm).

Previous workers have argued that the effective grain size of gold in a sample can be obtained from the variability of assays taken from the same sample. However, Au fire assays have large sample sizes specifically to reduce the sampling error on the assay. Models based on sampling statistics suggest that gold grain size in the 20- to 50- μm range can only be recognized if assays are carried out on samples <0.5 g. The preferred method is to generate a proxy by measuring Au with two sampling strategies, a fire assay sample for reliable Au grade and a small sample (0.5 g split) as a proxy for Au grain size. These analyses together can be used to generate an estimate of the Au grain size and a proxy for gravity gold recovery.