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IN SITU DISTRIBUTION OF GOLD IN ORES USING HIGH-RESOLUTION X-RAY COMPUTED TOMOGRAPHY

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Abstract

High-resolution X-ray computed tomography (HRXCT) is the industrial equivalent of medical computed axial tomography (CAT) scanning and provides a mechanism for nondestructive, three-dimensional analysis of ore samples. HRXCT produces two-dimensional images ("slices") that reveal the interior of an object as if it had been sliced open along the image plane for viewing. By acquiring a contiguous set of slices, a density map for all or part of a sample volume can be obtained, allowing three-dimensional inspection and measurement of features of interest.

HRXCT can resolve details as small as a few tens of microns, even when imaging objects are made of high-density materials. Because the HRXCT technique differentiates mineral grains largely based on their contrasting densities, these studies are particularly effective in the study of gold and other extremely high density grains in contrast to typical rock-forming minerals and other metallic minerals. Imaging of typical stockwork ore from the Grasberg porphyry deposit identified native gold grains as small as 13 μm in diameter. All of the gold grains are associated with chalcopyrite masses, indicating that both copper and gold concentrations occupy the same fracture porosity and thus appear to have been precipitated during the same mineralization event. These reconnaissance investigations suggest considerable potential for HRXCT studies to contribute to the understanding of ore-forming systems and to practical applications such as ore dressing to maximize precious metal recovery.

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