

Growth controls in colloform pyrite

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ABSTRACT

Primary colloform textures preserved in ore deposits can be a useful tool in understanding changing conditions of ore formation due to the sequential development of the colloform layers. However, the growth controls that influence formation of these textures are poorly understood. To try to address this problem, samples from two ore deposits, Greens Creek in Alaska and Ezuri in Japan, have been systematically analyzed for grain size and shape, crystal preferred orientation (CPO), sulfur isotope composition, and trace element content. Grain size and shape varies between layers of equant, ~20 μm crystals to acicular and elongate crystals up to several millimeters in length. Electron backscatter diffraction (EBSD) reveals that both samples have an initial random orientation of crystals with CPO in subsequent layers developed either about $\langle 100 \rangle$, $\langle 110 \rangle$, or $\langle 111 \rangle$ crystallographic axes. Despite similarity in texture, the sulfur isotope results from Greens Creek colloforms have a very negative, open-system bacteriogenic $\delta^{34}\text{S}$ between -40 and -32% , whereas the Ezuri colloform has a positive $\delta^{34}\text{S}$ of $\sim +5\%$, typical of hydrothermal sulfur in Kuroko ores. Trace element results indicate variability in As, Sb, and Cu distribution. Whereas trace element variability at Greens Creek appears to be related to changes in $\delta^{34}\text{S}$, with a heavier signature correlating with sequestration of Sb in outer layers, overall the detailed analyses reveal that in both Greens Creek and Ezuri, there is no systematic correlation between sulfur source or trace element sequestration and CPO. This suggests that the abrupt changes in CPO recorded appear most likely to be influenced by changes in degree of supersaturation.

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