

Fluid Inclusion Characteristics of Auriferous Quartz Veins in Archean and Paleoproterozoic Greenstone Belts of Eastern and Southern Finland

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Abstract

Fluid inclusions in auriferous quartz veins in five deposits in the Archean (2.9–2.7 Ga) and Paleoproterozoic (2.0–1.75 Ga) greenstone belts of eastern and southwestern Finland have been characterized on the basis of their composition, reconstructed isochores, and decrepitation behavior.

The dominant fluids associated with gold mineralization are H₂O-CO₂ ± CH₄ ± halite (Archean) and H₂O-CO₂-CH₄ or H₂O-CH₄ (Paleoproterozoic) in composition; phase ratios were generally uniform H₂O/CO₂ in the Archean but were variable in the Paleoproterozoic. In the Archean Au ± sulfide quartz veins, the mineralizing fluids contain less CH₄ (<30 mol %) and have higher salinities (up to 39 wt % NaCl equiv) than the corresponding fluids in the Paleoproterozoic Au-sulfide-quartz veins (up to 38 mol % CH₄ and below 13 wt % NaCl equiv). Additionally, the estimated pressure-temperature conditions for gold mineralization differ markedly between the two domains. Mineralization occurred in a pressure-temperature range of 300° to 500°C at 2 to 3.5 kbars in the Archean domain and 200° to 300°C at 1 to 2 kbars in the Paleoproterozoic domain.

Decrepigrams for the Archean and Paleoproterozoic auriferous quartz veins show different characteristics and permit classification of the different fluid inclusion populations on a regional scale.

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