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Hydrothermal Fluid Characteristics of Syenite-Hosted Quartz–Carbonate Veins at the Young-Davidson Orogenic Gold Deposit

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The Young-Davidson (YD) orogenic gold deposit, located at the western terminus of the Cadillac–Larder Lake Deformation Zone (CLLDZ) in the southwestern Abitibi greenstone belt, is hosted by syenite intrusions cut by multiple generations of quartz–carbonate veins. Although previous studies have established the paragenetic framework and major alteration styles at Young–Davidson, fluid inclusion petrography and microthermometry have not been systematically integrated within a single analytical framework. As a result, the distribution and preservation of fluid inclusion assemblages across vein textures and alteration styles remain poorly constrained, and the pressure–temperature conditions of the mineralizing fluids are not well defined.

This study combines petrographic analysis and fluid inclusion microthermometry of syenite-hosted quartz–carbonate veins to evaluate how vein textures and alteration styles control the distribution and preservation of fluid inclusion assemblages. In addition, whether fluid inclusion size and abundance show relationships with gold grade to investigate gold-carrying fluid conditions is assessed. Core logging is first used to identify representative vein textures and alteration styles and geochemistry. Texturally favorable samples are then selected for fluid inclusion petrography using quick-plate thick sections to evaluate inclusion distribution and preservation. Samples containing well-preserved and texturally constrained inclusion assemblages are subsequently prepared as doubly polished thick sections for detailed microthermometric analysis.

By integrating petrographic analysis with microthermometric constraints, this study refines pressure-temperature estimates of mineralizing fluids at Young–Davidson and gives us a better understanding of fluid characteristics in syenite-hosted orogenic gold systems.