An integrated structural, fluid inclusion, and stable isotope study of auriferous veins, The Ovens, southern Nova Scotia

Daniel J. Kontak¹, Rick J. Home¹, Darcy Baker², and Nicholas Culshaw³
¹Nova Scotia Department of Natural Resources, P.O. Box 698, Halifax, NS B3J 2T9
²Department of Geology, University of Newcastle, Callaghan, New South Wales 2308, Australia
³Department of Geology, Dalhousie University, Halifax, NS B3H 3J5

The Ovens area of southern Nova Scotia is underlain by interbedded slate and sandstone of the Meguma Group that were metamorphosed and deformed during the Acadian Orogeny. Rocks outcrop in the hinge zone of a northeast-trending anticline (chevron) and are cut by numerous auriferous quartz veins. Structural analysis of bedding-concordant and -discordant vein types indicates emplacement late in the deformation history during flexural-slip folding. Mutually cross-cutting relationships of the veins suggest synchronous emplacement of all vein types.

Quartz vein material collected from all vein types was examined for fluid inclusions. Results of a petrographic study indicate that inclusions are of secondary and pseudosecondary origin and record fluid migration during vein formation and subsequent deformation. The presence of abundant imploded inclusions in scheelite and, more rarely, in quartz reflects fluid overpressuring synchronous with vein emplacement. Petrography combined with thermometric measurements indicate the following inclusion types: (1) L²⁰ Ho–V with 4–19 wt. % eq. NaCl and minor amounts of dissolved carbonic species; (2) L²⁰ Ho–V-Halite with 30–36 wt. % NaCl; (3) carbonic CH₄ and CO₂-rich types with the latter characterized by very high densities; (4) H₂O-CO₂ with minor CH₄ and 5–10 wt. % NaCl. Isochoric projections combined with homogenization temperatures indicate a potentially large range in entrapment temperatures and/or ambient fluid pressure.

Analysis of 17 quartz vein samples from all structural