# Reconciliation and implications of SEM-EDS microscopy and fluid inclusion chemistry for the origin of the Meguma gold deposits, Nova Scotia

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The quartz vein-hosted gold deposits of the Meguma terrane, southern Nova Scotia, are well recognized as a classic example of orogenic slate-belt-hosted gold mineralization. Decades of work examining their regional geological setting, structural style, vein types, and contained mineralogy, time of formation, and geochemical signatures has not resulted in consensus regarding their origin and a range of models are still promoted. Whereas there may be agreement on the nature of the fluid, this being of metamorphic origin, the timing of fluid generation and source of this fluid and its contained metals, in particular Au, remain contentious, as occurs for most gold deposits settings globally. Here are reported recent observations and data that may reconcile these polarized views and, at the same time, advance our understanding of some aspects of these deposits. The new contributions are limited to SEM-EDS microscopy and fluid inclusion (FI) chemistry from a variety of gold deposits. The SEM-EDS observations focus on the nature of the thin layers or septa within the veins, these features commonly referred to as crack-seal (CS) layers, and two observations about these features are noted: (1) evidence for extensive fluid-rock reaction, which is generally absent in the wall rocks, is recorded both texturally and chemically by the presence of new mineral domains (e.g., Fe-rich chlorite, muscovite, tourmaline, apatite) which formed after wall rock material was entrained during antitaxial vein growth; and (2) the CS layers are rarely composed of carbonaceous material characterized by a black-shale like chemistry, that is enriched (to wt.%) in S, As, Zn, Cu, Co, Ni, and Pb. The chemistry of FIs, determined using the evaporate-mound method for >550 mounds, indicates distinct fluid types in terms of Na:K:Ca occur within (e.g., Beaver Dam, Caribou) and among deposits (18 deposits studied). These data support results of earlier LA ICP-MS analysis of FIs. The new observations and data are reconciled with previous work and ideas for the Meguma deposits as follows: (1) more than one fluid type, hence source and/or process, may be involved in vein formation; (2) some metals, including Au, and volatiles (S, C) may originate within carbonaceous layers in the local strata, but their extent and abundance is not constrained; (3) the biogenic signature for vein sulfides (δ34S) and carbonates (δ13C), which is globally anomalous, are consistent with the chemistry of the carbonaceous layers reported.

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