Evaporate analysis of quartz-hosted fluid inclusions by SEM/EDS: evaluation of method

Fergus Tweedale[1], Jacob Hanley[1], Dan Kontak[2], and Neil Rogers[3]

1. Department of Geology, Saint Mary's University, Halifax, Nova Scotia B3H 3C3 <fergus.tweedale@smu.ca> ¶ 2. Department of Earth Sciences, Laurentian University, Sudbury, Ontario P3E 2C6, Canada ¶ 3. Geological Survey of Canada, Ottawa, Ontario K1A 0E8, Canada

A cost-effective, relatively simple, and time-efficient alternative to the variety of techniques used to determine the bulk composition of fluid inclusions is the analysis of decrepitate, also evaporate, mounds This semi-quantitative method determines inclusion compositions by energy-dispersive analysis of precipitates, or mounds, produced by thermally inducing decrepitation of fluid-inclusion wafers (150–200 μm thick). The method is applicable to magmatic-hydrothermal systems where fluid inclusions contain > 95% of total weight (normalized) salt ions (e.g., Na, K, Ca, Cl, F). In order to assess the application of the method for evaluating the hydrothermal evolution and regional metal fertility of the large (7800 km^2), variably mineralized (e.g., Sn, W, Cu, U, Mo, Ta) South Mountain Batholith (SMB), Nova Scotia, the protocol is being evaluated and the results are reported here. Mounds containing 50, 75, and 95 wt. % NaCl were synthesized and decrepitate mounds analyzed using a LEO 1450VP (SEM) linked to an Oxford X-Max 80 mm-2 SDD detector. Based on decrepitating over a range of temperatures, from 350° to500°C, it appears that T ≤ 500°C is optimal since it produced large, well-shaped, and readily identifiable mounds amenable to raster analysis. To optimize analysis time and, hence, reduce analytical costs, data were collected with 5-, 10-, and 30-second acquisition times. In situ fractionation of mounds is assessed through comparison of point- and raster-mode analyses, whereas chemical heterogeneity is substantiated with X-ray mapping of large (i.e., > 20 μm) mounds. The number of analyses required to produce a representative result is discussed by comparison of results for 4, 8, 16, 32, 64, and 128 analyses of mounds for individual samples. The results of aforementioned analytical conditions will be presented and discussed in the context of the optimal conditions to be applied in the regional study of the SMB, the first of its kind ever conducted.

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