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Assessment of the diamond-trap method for studying high-pressure fluids and melts and an improved freezing stage design for laser ablation ICP-MS analysis

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Abstract

Diamond-trap experiments in combination with laser ablation ICP-MS analyses of frozen samples have been used to directly determine the composition of fluids and melts in equilibrium with crust and mantle mineral assemblages. Here we: (1) describe an improved freezing cell that utilizes electronic cooling elements to facilitate routine laser ablation measurement on diamond traps and (2) demonstrate that the major element stoichiometry of subsolidus aqueous fluids in equilibrium with crystalline mineral assemblages can be measured using the diamond-trap method with comparable precision and accuracy to single-crystal weight-loss experiments.

Keywords: Experimental geochemistry, diamond trap, mineral solubility, high-pressure fluid, freezing stage, LA-ICP-MS