Crystallization of miarolitic pocket minerals: Insights from hydrothermal diamond anvil cell experiments

VICTORIA MANETA[1]*, ALAN J. ANDERSON[1]

[1]Earth Sciences, St. Francis Xavier University, Antigonish, NS, Canada (*correspondence: vmaneta@stfx.ca, aanderso@stfx.ca)

Hydrothermal diamond anvil cell (HDAC) experiments allow direct visual observation of the crystallization dynamics of geological materials in real time. In the present study, we used the HDAC to monitor the crystallization of natural H_2O-saturated granitic melts (Li-free) and granitic melts enriched with 8400 ppm lithium (Li-enriched).

In all experiments, crystallization progressed by means of a high flux of essential elements (Na, Al, Si, K) from the melt to the growing crystals through a coexisting aqueous fluid phase [1, 2]. Euhedral quartz and alkali feldspar megacrysts (Fig. 1) exhibited low nucleation densities and rapid growth rates in the order of 3–60 cm/yr. These minerals were accompanied by clusters of much smaller crystals of muscovite in Li-free and α-spodumene in Li-enriched charges, which showed substantially higher nucleation densities. Microthermometric measurements of primary fluid inclusions in euhedral quartz indicate that the solute content of the coexisting aqueous fluid remained low during crystallization.

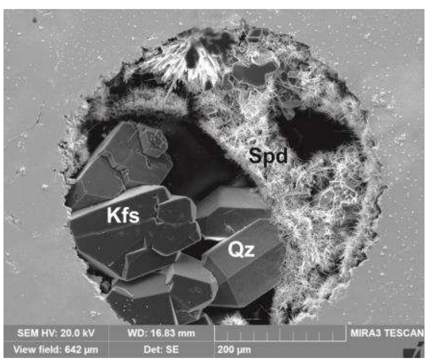

Figure 1: K-feldspar (Kfs) and quartz (Qz) megacrysts accompanied by clusters of α-spodumene (Spd) crystals formed at 500 °C and 380 MPa.

The HDAC experiments demonstrate the importance of a low-solute aqueous fluid phase as a medium of transport involved in the formation of giant euhedral crystals encountered in miarolitic pockets of granitic pegmatites.

[1] Jahns & Burnham (1969) *Econ Geol* **64**, 843–864. [2] Jahns (1982) *Mineral Assoc Can, Short Course Handbook* **8**, 293–327.