



## **Diffusive reequilibration of quartz hosted silicate melt inclusions: an experimental study**

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Anomalously low concentrations of Na<sub>2</sub>O (0.1 to 0.5 wt%) in unheated SMI in quartz have been reported from several plutonic rocks. We conducted experiments in cold seal pressure vessels to determine if the composition of quartz-hosted SMI can be modified after entrapment (710-780 °C, 150 and 200 MPa). SMI from the same inclusion assemblages were analyzed by LA-ICPMS and EPMA before and after the experiments. Na<sub>2</sub>O content of originally Na-deficient SMI strongly increases (up to 1.5 to 4.5 wt%) during reheating in dry Argon pressure medium and open Ag<sub>70</sub>Pd<sub>30</sub> capsules. During the same experiments the Ag and Cu content of the same inclusions increased by about two and one orders of magnitude, respectively. We believe that the capsule material was the source of the metals. Further experiments in sealed Au capsules have shown that SMI 10 to 100 μm below the sample surface with originally normal granitic Na<sub>2</sub>O content lose 92 to 99.6 relative% of their Na content in interaction with 1 and 4 molal pure HCl solution within 1 to 3 days. Quartz chips with initially Na-deficient silicate melt inclusions were held together with an aqueous chloride solution doped with Na, K, Fe, Li, Cs, Rb, Sr, Ba, La, Mo, Sb, Sn and Nb for 8 days (710 °C, 200MPa). A small amount of haplogranite glass was used to monitor the equilibrium melt composition. SMI nearly fully reequilibrated with respect to their Na and Li content with the external fluid while all other elements behaved immobile. We suggest that cations with 1+ charge and an ionic radius not larger than that of Na<sup>+</sup> (H<sup>+</sup>, Li<sup>+</sup>, Cu<sup>+</sup>, Ag<sup>+</sup>, Na<sup>+</sup>) can very rapidly diffuse through quartz at near magmatic temperatures, and the typically Na deficient composition of SMI in plutonic rocks is produced by an Na<sup>+</sup>/H<sup>+</sup> exchange reaction between the trapped melt and high-temperature HCl-rich magmatic volatiles interacting with the host quartz. The lack of observable diffusion profiles

suggests very rapid movement of these elements through the quartz.