

Melt inclusion insights on rhyolites proposed as a source of economic lithium in Clayton Valley, Nevada

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Lithium is a high-demand, energy-critical element used in lightweight rechargeable lithium-ion batteries [1, 2] that is primarily produced from pegmatites and brines in arid, closed lacustrine basins [3]. Clayton Valley, NV, is the only current U.S. producer of Li from subsurface brines and hosts Li-bearing clays that could be a potential new resource. Locally-exposed rhyolite tuffs have been proposed as a Li source for this brine and clay deposit [4].

We investigate quartz- and feldspar-hosted melt inclusions, pumice glass, and minerals in Miocene rhyolite tuff outcrops surrounding Clayton Valley. Our goal is to characterize pre- and post-eruptive lithophile, volatile, F/Cl, and Li isotopic contents and mineral-melt partitioning in rhyolites using Raman, FTIR, EMP, SIMS, and LA-ICP-MS.

Preliminary results show that melt inclusion shrinkage bubbles contain extremely low CO₂ contents that are not resolvable by Raman. FTIR analyses reveal that melt inclusions contain ~1-7 wt% H₂O and ≤300 ppm CO₂ corresponding to vapor saturation pressures of ≤250 MPa (≤6 km depth). Melt inclusions and pumice glass are trachydacite to ferroan rhyolite with ASI~1.0-1.3, Cl~500-1500 ppm and F~1000-2400 ppm. Feldspars range in composition from oligoclase to labradorite to sanidine, and biotites range from ~0.45-0.7 X_{Mg} and ~5.0-6.3 IV(F/Cl). Magnetite-ilmenite pairs indicate equilibration at ~710-780°C and $f_{O_2} \sim \Delta NNO + 1.2$. Upcoming SIMS and LA-ICP-MS analyses will allow calculation of lithophile mineral-melt partitioning and shed light on lithophile and Li isotopic abundances to understand the source, concentration, and release mechanisms of Li in rhyolitic magmas.

[1] American Physical Society (2011) *Amer Physical Soc*, 24. [2] Goonan (2012) *USGS Circ* **1371**,14. [3] Kesler et al. (2012) *Ore Geol Rev*, 55-69. [4] Hofstra et al. (2013) *Soc Econ Geol* **108**, 1691-1701.