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Magmatic Glass as a Source of Lithium: A Case Study of the Cerro Galán Ignimbrite of Northwest Argentina

Conor Farrell[1], Alison Rust[1], Edward Bunker[2], Stephen Edwards[2], Naomi Thompson[2], Joseph Emmings[2]
1. University of Bristol, Bristol, United Kingdom, 2. CGG, Crawley, United Kingdom

Lithium (Li) is a metal of strategic and societal importance due to its use in high-energy-density batteries. Global demand for Li is projected to increase nearly ten-fold by 2050 in response to the electrification of vehicles and transformation of energy production and storage. To meet this demand, better understanding of the sources, transport, and sinks of Li is fundamental to ensuring effective mineral exploration and discovery of new deposits of this critical metal.

Roughly 58% of known Li reserves are hosted within evaporative saline basins, such as the salars of the Atacama Desert in South America. Several Andean salar basins contain dissolved Li concentrations exceeding 1,000 mg/L, representing highly economic prospects for Li extraction, whereas others have relatively low Li concentrations of <10 mg/L and are considered uneconomic. A key control on Li enrichment in salar brines is the presence of Li sources within the catchment, which are principally believed to be Li-bearing silicic volcanic glasses in ignimbrites that release their Li during weathering.

Here, we investigate ignimbrite textures, compositions, and physical properties in terms of controls on Li mobility and enrichment in salar systems. The Cerro Galán ignimbrite is recognised as a major Li source for the Salar de Hombre Muerto in northwest Argentina and is considered an archetype source rock in salar systems. A suite of samples from Cerro Galán were studied to better constrain the magmatic and volcanic processes leading to enrichment of Li. We identify and explore the key physio-chemical characteristics that facilitate liberation of Li into solution and frame our findings in the context of the design and implementation of regional fertility assessments in the search for undiscovered Li brine deposits.