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Lithium origin in playa at Nevada, USA: constrains by lithium isotope ratio

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Highly concentrated lithium resources are often formed in salt crusts and playas by repetition of water evaporation and inspissation. Lithium-rich brine in playas has been the major raw material for lithium production worldwide. Recently, lithium isotopic ratio has been known as a new tool for understanding water-rock interaction. To estimate lithium origin in playas, we conducted two kinds of leaching experiment to evaluate the change of lithium isotopic ratios via leaching process, and determined isotopic ratios and contents of lithium and strontium as well as trace element contents, of various lacustrine and evaporite deposit samples collected from several playas in Nevada, USA.

The lithium isotopic values of the samples from the playas were much lower than those of river and ground waters in the world, and close those of volcanic rocks. The lithium isotopic results suggested that lithium concentrated in playas had been supplied mainly by water-rock interaction at high temperature by local hydrothermal activities, not directly by surface weathering processes at low temperature.

This is consistent with the positive correlation between temperature and lithium isotopic ratio during water-rock interaction. This study is the first to report lithium isotopic composition at playas, demonstrating that the lithium isotopic ratio has a large potential to trace the origin of lithium and the lithium accumulation processes in playas.

Keywords: lithium isotope, Playa, evaporite, lacustrine deposit, lithium resource, Nevada