Titanium isotopic composition of CAIs from the Axtell and Leoville carbonaceous chondrites

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The Ti isotopic compositions previously determined for "normal" (i.e., non-FUN) calcium-aluminum-rich inclusions (CAIs) from primitive chondrites display relatively small, but resolvable mass-independent anomalies, most likely of nucleosynthetic origin [1-10]. However, the limited dataset makes it difficult to conclude whether this range of compositions reflects the degree of heterogeneity in the early Solar System or is due to restricted sampling of CAIs. Therefore, a comprehensive Ti isotopic study of CAIs from a variety of primitive chondrite classes is needed to fully elucidate the degree of heterogeneity of Ti isotopes in the Solar Nebula.

Here, we report the Ti isotopic compositions of several CAIs from the Axtell and Leoville CV3 chondrites. Four CAIs from Axtell and five CAIs from Leoville were physically separated from slabs of these meteorites and then dissolved. Purification of Ti from the CAI solutions was achieved using cation and anion exchange chemistry. The Ti isotope ratios were then analyzed using the Neptune MC-ICP-MS at Arizona State University. The range of measured Ti isotopic compositions in these CAIs (ε^{46}Ti = –0.76 to +1.68, ε^{48}Ti = –0.11 to +0.31 and ε^{50}Ti = +1.34 to +10.88 for Axtell CAIs; ε^{46}Ti = +0.83 to +2.20, ε^{48}Ti = +0.21 to +1.09 and ε^{50}Ti = +9.25 to +12.25 for Leoville CAIs) is in agreement with those reported previously for normal CAIs from Allende, Axtell, Efremovka, Leoville and Vigarano [1-10]. Our initial findings suggest that normal CAIs record a restricted range of Ti isotopic compositions irrespective of their parent body, but this remains to be more rigorously tested with additional analyses of CAIs from a broader range of primitive chondrites.

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