Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10949

Experimental determination of Sn isotope fractionation between metal and silicate

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Sn is a moderately volatile element that can be used to trace the history of volatile elements of planets. Sn is also a moderately siderophile element that can be incorporated in planetary cores. Therefore, the determination of the isotopic fractionation factor between metal and silicate is crucial to understand how Sn isotopes behave during planet formation.

In this study, we report the force constants of metallic Sn in iron alloys determined by Nuclear Resonant Inelastic X-ray Scattering (NRIXS) [1]. In parallel, we also performed metal-silicate equilibration experiments with a centrifuging piston cylinder [2] to determine the Sn isotope fractionation between metal and silicate. This methodology allows a clean separation of the metallic and silicate fraction, avoiding cross contamination between phases. The experiments were designed to obtain Sn in the form of Sn^{2+} while the duration of experiments was tested to allow full equilibration between metal and silicate. In this case, the Sn isotope composition of the metals and silicates was measured using a double-spike technique by MC-ICP-MS on a Neptune Plus [3]. This study allowed a comparison of two independent but complementary experimental methods giving more confidence in the results. We obtained measurable Sn isotope fractionation between metal and silicate and the implications of our data will be discussed at the meeting.

References

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