Unveiling the Sun's Formative Environment: Isotopic Analysis with LG-SIMS Delivers Invaluable Insights

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Short-lived radionuclides

What are short-lived radionuclides?

- Short-lived radionuclides are radioactive elements with a "short" half-life (10 – 1 000 thousand years). This means they are extinct today: No ^{26}Al remain in natural samples.

^{26}Al and the Al/Mg chronometer

- ^{26}Al has a half-life of 717,000 years.
- ^{26}Al decays into ^{26}Mg: excess of ^{26}Mg betrays past ^{26}Al content, which is used to date early solar system solids.

How to go back in time?

Chondrites meteorites

- Chondrite meteorites are primitive and complex meteorites that contain records of the early stages of the Solar System. chronology of events and astrophysical environment conditions.

What are CAIs?

- Calcium- and Aluminium-rich inclusions (CAIs) are µm to cm-sized mineral assemblages observed in the most primitive chondrite meteorites.
- They are the oldest dated solid of the Solar System going back up to 4.567 Ga ago, and invaluable objects to study its early stages.

What can we infer from short-lived radionuclides in meteorites?

Understanding the past

- Short-lived radionuclides help us answer fundamental questions regarding the birth of the solar system, or the processes of planet formation.

The case of ^{26}Al

- It is thought to have been injected into the young Solar System by the explosion of a Supernovae nearby.
- This is inferred by its quick homogenization through the young solar system, within 50 000 years.

The case of ^{10}Be

- On the contrary, the distribution of ^{10}Be is heterogeneous, indicating a more local origin, such as a formation by spallation during protosolar flares.

QUICK TIPS

Why the LG-SIMS?

The LG-SIMS is an ideal tool, as it offers:

- high spatial resolution (down to 2 µm in spot analyses, sub-µm in image mode),
- high transmission at high mass resolution
- high analysis precision (down to 0.1 ‰).

Watch the webinar:

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