Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17698

High precision triple oxygen isotope composition of small size urban micrometeorites

FABIAN ZAHNOW[1], TIDO STRACKE[1], TOMMASO DI ROCCO[1], THILO HASSE[2] AND ANDREAS PACK[1]

[1]Georg-August-Universität Göttingen
[2]Museum für Naturkunde Berlin

Presenting Author: fabian.zahnow@uni-goettingen.de

Triple oxygen isotope variations are used to reconstruct the formation history and alteration of terrestrial and extraterrestrial samples. We present an approach for high precision $\Delta'^{17}O$ analysis of silicate and oxide materials in the mass range down to 1 µg with oxygen amounts of down to 10 nmol. This is achieved using automated laser fluorination oxygen extraction and continuous flow isotope ratio mass spectrometry. The analytical uncertainty in $\Delta'^{17}O$ is ≤0.040 ‰ over the entire mass range (1 µg to 30 µg) which is about an order of magnitude more precise than in situ techniques such as secondary ion mass spectrometry.

Using the capabilities of this technique, we report the first high precision triple oxygen isotope data on small S-type cosmic spherules (mean mass 17±3 µg) collected from an urban rooftop in Berlin, Germany. Our results indicate that the urban micrometeorites sample the same population as Antarctic micrometeorite collections. 70 % of the modern micrometeorite influx is related to carbonaceous chondrites and 30 % to ordinary or enstatite chondrite parent bodies.

The young urban micrometeorites are not affected by secondary terrestrial oxygen isotope alteration, which is supported by our findings. Furthermore, they are comparatively easy to collect and are available in large quantities, making them a valuable source for influx and distribution studies. The application of laser fluorination continuous flow triple oxygen isotope analysis to these samples allows for more confident identification of micrometeorite parent bodies while considering potential terrestrial interaction processes.