Stable cadmium isotopes in carbonaceous chondrites revisited

W. ABOUCHAMI[1*], F. WOMBACHER[1], N. BRAUKMÜLLER[1], S.J.G. GALER[2]

[1] Universität zu Köln, Institut für Geologie und Mineralogie,
Zülpicher Straße 49b, 50674 Köln, Germany
(*correspondence: wafa.abouchami@mpic.de)
[2]Max-Planck Institute für Chemie, Hahn-Meitnerweg 1,
55128 Mainz, Germany

Previous stable Cd isotope studies on carbonaceous chondrites (CC) have indicated that most share identical isotopic signatures with that of the Bulk Silicate Earth (BSE), with no resolvable isotope effects due to volatile element depletion [1, 2]. This is suprising considering that Zn and Ga, less volatile than Cd, display increasingly lighter isotopic signatures with increasing volatile element depletion [3, 4].

We present high-precision TIMS double-spike Cd isotope data along with Cd concentrations determined by isotope dilution on terrestrial samples as well as selected CC. In addition, a heating experiment in Ar atmosphere of Murchison CM2 chondrite powder provides means to assess the degree of isotope fractionation due to evaporative Cd loss.

The new Cd isotope data show that the BSE value agrees within uncertainty with previous estimates [5]. The data for the heated Murchison powder displays an enrichment in heavy Cd isotopes and significant Cd depletion with increasing temperature, consistent with a kinetic Rayleigh evaporation process. Compared to Earth, CC display increasingly heavier Cd isotope compositions in the order: CV3, CO3, CM2 and CI, with the volatile-rich Orgueil ($\varepsilon^{112/110}$Cd=+1.1±0.27) off the main trend, however. This trend is overall similar to that observed for Zn isotopes [3] and inconsistent with expectations for partial evaporation.

Variable volatile element depletion within different CC groups have been attributed to partial condensation or mixing of chondrules and volatile-rich matrices [e.g. 6,7]. The Cd isotopic variations found in CC cannot be however, with the data at hand, *simply* reconciled with a CI-chondrule matrix mixing, providing potentially new clues on the mechanisms and origin of volatile element depletion in the Solar System.

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