COMPARISON OF MG ISOTOPE COMPOSITIONS BETWEEN BULK METEORITES AND MAFIC-ULTRAMAFIC ROCKS FROM TERRESTRIAL MANTLE.

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Introduction: It is still few and inconsistent for the published Mg-isotope data of terrestrial and extraterrestrial samples [1, 2, 3]. In addition, whether terrestrial materials show Mg isotopic characteristics similar to chondrites or non-chondrites has been disputed [2, 3]. Here we present Mg isotopic data of sixteen peridotites (including mineral separates), ten basalts and picrites derived from the mantle, and four bulk meteorites analyzed by MC-ICPMS. Based on the new data, this study attempts to better understand Mg isotopic variation and fractionation in solar nebula and earth mantle.

Results and Discussions: Mg isotopic compositions of 3 chondrites, i.e. Allende (CV3), Ningqiang (ungrouped C3) and Jilin (H5), are rather homogeneous, with δ^{26}Mg (relative to DSM3) between 0.04 ‰ and 0.06 ‰ and δ^{25}Mg between 0.01‰ and 0.03‰. The bulk sample of GRV 99027, a martian lherzolite little contaminated by the crust of Mars [4, 5], has the same Mg isotopic composition as the chondrites, with δ^{26}Mg of 0.04±0.02 ‰ and δ^{25}Mg of 0.00±0.02 ‰. The uniform data of the various chemical groups of chondrites and the martian meteorite indicate that the solar nebula has a rather homogeneous Mg isotopic composition, similar to iron isotopes [6].

The similar Mg isotopic composition of the martian lherzolite with those of chondrites suggest little fractionation of Mg isotopes during formation of GRV 99027. In contrast, terrestrial mafic and ultramafic rocks that probably derived from the mantle display significant variation of δ^{26}Mg from -0.52‰ to 0.19‰, suggestive of heterogeneous compositions of Mg isotopes of the terrestrial mantle. These variations may not be due to simple partial melting and/or fractional crystallization, because mineral separates (including olivine, clinopyroxene and orthopyroxene) of the peridotites show no fractionation of Mg isotopes.

It is also noted that most of the terrestrial ultramafic rocks analyzed in this work are depleted in heavier isotopes of Mg relative to chondrites. In addition, a loess samples, which may represent the mean crust of the Earth, have δ^{26}Mg of -0.41 ‰. To account for mass balance, heavier Mg isotopes-enriched components are required if the Earth has a bulk composition of chondrites.

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