EVIDENCE FOR ^{26}AL HOMOGENEOUS DISTRIBUTION IN THE EARLY SOLAR SYSTEM FROM CHONDRULES MG ISOTOPIC COMPOSITION. J. Villeneuve[1], M. Chaussidon[1], G. Libourel[1,2], [1]CRPG-Nancy Université-INSU-CNRS, UPR2300, BP 20, 54501 Vandoeuvre-lès-Nancy, France. [2]ENSG-Nancy Université, 54500 Vandoeuvre-lès-Nancy, France. (Email: johanv@crpg.cnrs-nancy.fr)

The knowledge of precise timescales for early processes in the solar nebula provides strong constraints on models of the protosolar nebula. With a half-life of 0.73 Ma, ^{26}Al is potentially a high resolution relative chronometer for objects formed earlier in the solar nebula. A recent bulk-rock isochron from Allende CAIs show a $(^{26}Al/^{27}Al)_0$ ratio of 5.23 (± 0.13) × 10^{-5} and $\delta^{26}Mg^*_0$ of -0.040 (±0.029)‰ [1] Chondrules show lower $(^{26}Al/^{27}Al)_0$ ratios (< 2 × 10^{-5}) than CAIs [2-5, and references therein]. However, since the initial Mg isotopic compositions of chondrules have never been determined precisely, the evolution of Mg isotopes in the solar nebula cannot be discussed.

Here we report the first high precision ion probe analysis of Mg isotope composition (and Al/Mg ratio) in chondrules, which allow to determine precisely both the slope and the initial of the ^{26}Al isochrons. Measurements were performed with the CRPG-CNRS ims 1270 ion microprobe in multi-collection mode, using four Faraday cups. A typical external reproducibility of ± 0.005‰ (2σ) can be reached for Δ^{26}Mg determination in standards. In chondrules internal errors for $\delta^{26}Mg^*$ were ranging from ± 0.015‰ to ± 1.983‰ depending of the Mg contents. Fourteen ferromagnesian chondrules show well-resolved isochrons with $(^{26}Al/^{27}Al)_0$ ranging from 1.619 (± 0.1672) × 10^{-5} to 3.023 (± 1.240) × 10^{-6} and $\delta^{26}Mg^*_0$ ranging from -0.0185 (± 0.0140) ‰ to 0.0047 (± 0.0098) ‰.

Our Al-Mg data can be compared to that for bulk CAIs [1] in a simple model of closed system evolution of Mg isotopes in the protosolar disk and allow to demonstrate that ^{26}Al and Mg isotopes were homogeneously distributed at respectively ~ ± 0.5 × 10^{-5} (~ ± 10%) and ~ ± 0.004‰ in the inner solar system. In that case supra-canonical values for $(^{26}Al/^{27}Al)$ in CAIs [6] and large $\delta^{26}Mg^*$ variations in hibonites [7] could be understood as to be due to fractions of components with supra-canonical ratios and hibonites type materials within CAIs and chondrules precursors. These results also provide very new constraints for astrophysical models of origin of ^{26}Al and formation of chondrules, e.g. (i) for the source of ^{26}Al (by irradiation from the young Sun or last minute injection from a nearby SN), (ii) for mixing processes that allow to homogenize both ^{26}Al and Mg isotopes within the disk (iii) for timescales of formation of chondrules and their precursors, (iv) for chondrules preservation in the accretion disk as single floating objects for a few millions years.

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