Inhomogeneous molecular cloud core and isotope anomalies in meteorites

T. NAKAMOTO[1]* AND A. TAKEISHI[1]

[1]Department of Earth and Planetary Sciences, Tokyo Institute of Technology, Meguro, Tokyo 152-8551, Japan (*correspondence: nakamoto@geo.titech.ac.jp)

Isotope Anomalies in Meteorites

Formation ages of various meteorite parent bodies were evaluated and found to be in a good correlation with the degree of ^{54}Cr anomalies [1], except for CAIs [2]. We study a model explaining the origin of the observed anomalies.

Model

We assume that isotopically heterogeneous dust grains are inhomogeneously distributed in the initial molecular cloud core; especially, ^{54}Cr-rich grains are more concentrated in the centeral part of the core. We calculate the concentration of ^{54}Cr-rich grains as a function of the time and the place in the solar nebula. Principal model parameters include the initial angular velocity of the molecular cloud core ω and the turbulence strength of the solar nebula α.

Results

Figure 1 shows calculated ^{54}Cr-rich grain concentrations as a function of time. Model parameters are $\omega = 10^{-14}$ s^{-1} and $\alpha = 10^{-3}$. In the early phase (< 0.4 Myr), the concentration decreases because of the addition of the other dust from the core. Later (> 0.4 Myr), the concentration increases due to the diffusive motion in the nebula. These features are consistent with observations [1, 2].

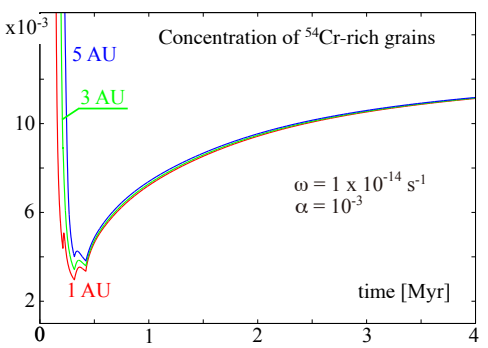

Figure 1: Calculated concentrations of ^{54}Cr-rich grains at 1, 3, and 5 AU as a function of time.

[1] Sugiura and Fujiya (2014) *Meteorit. and Planet. Sci.* **49**, 772-787. [2] Trinquier *et al.* (2009) *Science* **324**, 374-376.