**C003-001** Room: 101B Time: May 28 13:45-14:00

# The early solar system chronology from the high precision 26Al-26Mg dating

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The meteoritic samples are derived from asteroidal bodies and they recorded the earliest history of the planetary evolution. The recent chronological studies of meteorites indicate that the formation of solid grains in the solar nebula and the earliest igneous processes on the asteroidal-size bodies took place within 10 million years (M.y.) after the birth of the solar system. The short-lived nuclide 26Al, which decays to 26Mg with a half-life of 0.73 M.y., is useful chronometer to determine the relative time scale of early planetary evolution with fine time resolution (0.1-1M.y.). The initial 26Al/27Al ratios of individual samples, which are estimated from the correlated 26Mg excesses with the 27Al/24Mg ratios (26Al-26Mg isochron), are converted to the age relative to Ca, Al-rich Inclusions (CAI) with the canonical initial 26Al/27Al ratio of 5E-5 (McPherson et al., 1995). In order to determine relative ages precisely, the high precision Mg isotopic measurement technique was developed for the secondary ion mass spectrometer (SIMS) IMS-1270 in Geological Survey of Japan. It is possible to determine a small 26Mg excess of 0.5 permil from a single analysis of 3-12 micron beam size. The recent studies on 26Al-26Mg dating of chondrules and polymict urerilite are reviewed and the time-scale of the early evolution of the solar system is discussed.

(1) Chondrules from unequilibrated ordinary chondrite: Six-teen chondrules from the least metamorphosed LL chondrites (LL3.0-3.1) showed the range of initial 26Al/27Al ratios between 4E-6 and 2E-5, corresponding to the ages 1-3 M.y. after CAIs (Kita et al., 2000; Mostefaoui et al., 2002). These ages correlated with the Si/Mg, Mn/Mg and Na/Mg ratios of bulk chondrules, indicating that older chondrules are depleted in volatile elements (Tachibana et al., 2002). The time scale of chondrule formation is consistent with typical life-time of proto-planetary disk from astronomical observations. The chondrule forming events might cause volatile-controlled chemical fraction to the solid materials in the disk.

(2) Polymict ureilite: polymict ureilite contains plagioclase-bearing clasts, which were derived from missing-basalts in the ureilite parent body. Petrology, oxygen isotopes and trace element analyses of these clasts indicate that they are derived from multiple sources that are produced by fractional melting of the ureilite precursor (Ikeda et al., 2000; Kita et al., 2000; Kita et al., 2001). Several plagioclase-bearing clasts plot on a single isochron with initial 26Al/27Al ratio of 4E-7, corresponding to 5 M.y. after CAIs (Kita et al., 2003). This initial 26Al/27Al ratio is similar to those of eucrites (1.2E-6; Nyquist et al, 2001) and plagioclase in H4 chondrites (1.5-2.8E-7; Zinner et al., 2002), and significantly lower than the lowest values observed from chondrules. These results indicate that formation of planetesimal took place about 3M.y. after CAIs. The internal heat in small bodies generated from the decay of 26Al, which caused planetary scale differentiation (eucrite), local scale partial melting (ureilite), and thermal metamorphism (chondrite).

Further investigations on the 26Al-26Mg systems in meteoritic samples are promising to clarify the time scale of various processes occurred in proto-planetary disk and earliest meteorite parent bodies.