Correlation of ^{26}Al ages with bulk compositions of ferromagnesian chondrules in CO and CV chondrites

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In recent study of least equilibrated ordinary chondrites (UOC; Semarkona LL3.0 and Bishunpur LL3.1), ^{26}Mg excesses were found in mesostasis of common ferromagnesian chondrules. The range of $(^{26}Al/^{27}Al)_0$ of these chondrules corresponds to the time interval of ≥ 1Ma after CAIs (Kita et al., 2000; Mostefaoui et al., 2002). These initial $^{26}Al/^{27}Al$ ratios are correlated with bulk chemical compositions, showing younger chondrules tend to be rich in Si and volatile elements. This relation is interpreted to be the change of chemical compositions of chondrules through repeated partial evaporation, recondensation, and separation of gas and chondrules (Tachibana et al., 2001; Mostefaoui et al., 2002).

Carbonaceous chondrites contain less abundant chondrules (30-40%) relative to ordinary chondrites (60-80%), and the relationship between ages and bulk compositions is expected to show a systematic difference. We have initiated systematic investigation on least equilibrated carbonaceous chondrites, Y81020 (CO3.0) and Efremovka (CV3) using SEM, EPMA and SIMS to determine their textural, chemical, isotopic and chronological characters.

22 chondrules examined in Y81020 and Efremovka are mostly type I. Efremovka also contains type II chondrules. None of them are Al-rich chondrules (Al_2O_3 < 10wt%). The bulk compositions of these chondrules tend to show higher Al, Ca and Ti contents and lower Fe, Mn, K, Na contents than those in UOC. Furthermore, they show Mg-fractionation in MgO-SiO_2-(CaO+Al_2O_3) diagram. Our preliminary data indicate that chemical fractionation processes among chondrules are not the same in ordinary and carbonaceous chondrite forming regions. Further isotopic and chronological studies will help understanding of the detail mechanism of CO and CV chondrule formation.

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Do glasses in achondritic meteorites share a common source?

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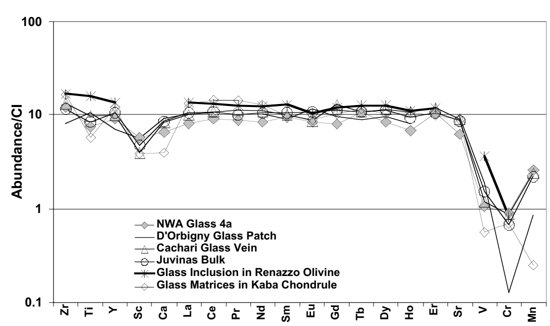
Howardites, eucrites and diogenites are breccia achondrites and are widely believed to be impactites from a parent body [1-3]. Howardites and eucrites also contain glass objects with major element chemical compositions that are similar to those of their respective bulk rocks – an apparent support of this belief. The recently discovered howardite NWA 1664 has abundant glass objects that are heterogeneous in their major and minor element abundances [4]. They range in composition from the Mg-rich Bununu group to the Fe-rich eucrite group and have very high K_2O contents (up to 1.2 wt%). This suggests individual formation and processing of the glass objects [4] similar to what happened to chondrules of chondrites rather than simple mixing and (shock) melting of anorthite+pyroxene In contrast to the major elements, refractory lithophile trace element (TE) abundances in glass objects are unfractionated at 10 x CI (Fig.). They obviously signal a common homogeneous source that had chondritic relative TE abundances. Furthermore, abundances of TEs in glasses from NWA 1664 are similar to those in glasses from the eucrite Cachari and the angrite D'Orbigny and to the bulk eucrite Juvinas [5].

The very similar refractory TE abundances in glasses of howardites, angrites and eucrites likely indicate derivation from a common source. Achondrite glass objects share this feature with Ca,Al-rich glasses from glass inclusions in olivines of carbonaceous chondrites (Fig.) [6-8]. Consequently, all these glasses seem to have a common source with chondritic relative abundances of refractory TEs. Deficits in moderately volatile elements signal vapor-liquid fractionation.



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