6.3.P03

Heliocentric distance of the parent bodies of two E chondrites ALH85119 and MAC88136

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E chondrite parent bodies are considered to have formed at a region closer to the Sun than other chondrites on the basis of the mineralogical and chemical properties [1]. However, there is no evidence indicating directly the heliocentric distances of the E chondrite parent bodies. We calculated the heliocentric distances (r_P) of the parent bodies of the two E chondrites ALH85119 and MAC88136 based on the noble gas analyses and theoretical methods [2].

Asteroids are exposed to solar wind (SW), which can penetrate only several hundred Å [3]. The SW noble gases implanted into the meteoroid surface were lost during the atmospheric entry. The presence of SW noble gases in meteorites indicates that the raw materials of the meteorites had been exposed to SW on the parent bodies. The concentrations of SW noble gases implanted per unit time are inversely proportional to r_P^2, because the flux of SW is in inversely relation to r_P^2. The flux of galactic cosmic ray (GCR) is assumed to be constant in the solar system, and cosmogenic noble gases produced by GCR are independent of r_P. The duration (T_P) for which the raw materials were exposed to SW and GCR on the parent body is calculated from the concentrations of cosmogenic noble gases. The concentrations of SW noble gases implanted per unit time are calculated by dividing T_P into the concentrations of SW noble gases. The r_P can be calculated by comparison between the concentrations of SW noble gases implanted per unit time of the two E chondrites and those of lunar meteorites.

Calculated r_P are 2.0±0.3AU and 2.9±0.4AU for ALH85119 and MAC88136, respectively. E chondrite parent bodies are considered to be E- and M-type asteroids, because of similarities of reflectance spectra between E chondrites and E- and M-type asteroids [e.g., 4]. The E- and M-type asteroids distribute at the inner part of asteroid belt (1.8-3.2AU) [5]. The calculated heliocentric distances of the two E chondrites are in good agreement with the current E- and M-type asteroid distributions. It is therefore inferred that the heliocentric distances of the E chondrite parent bodies are relatively constant from a certain period in the past to present.

References

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6.3.P04

Amoeboid olivine aggregates from the Semarkona LL3.0 chondrite

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Introduction:

Amoeboid olivine aggregates (AOAs) are major types of refractory objects in carbonaceous chondrites (CC). However, AOAs from ordinary chondrites (OC) have not been reported, even though fine-grained CAIs from OC have been found [e.g. 1]. Here we report the petrography and oxygen isotopic compositions of AOAs from the Semarkona LL3.0 chondrite, in order to compare the petrography and oxygen isotopic compositions of AOAs in OC and CC, and establish the genetic relationships between CAIs and AOAs in the early solar system.

Results and Discussion:

We carried out petrographic study of three AOAs from a thin section of Semarkona LL3.0 chondrite. The AOAs were irregularly shaped and 50-300μm across in size, composed of forsterite ($Fo_{99\text{-}100}$) and Ca-Al-rich components consisting of diopside (TiO_2=~0.5wt%; Al_2O_3=~1wt%) and anorthite. Each AOA has no both alteration minerals and fayalitic olivine. The AOAs from Semarkona LL3.0 chondrite have similar sizes to AOAs from CO3.0 chondrites [e.g. 2, 3]. The petrography of AOAs shows that Semarkona AOAs have not been altered or metamorphosed, that is, they have a similar texture to those from CO3.0 chondrites. The O-isotopic compositions of each phase, all minerals (diopside, anorthite, and olivine) composing the AOAs, are enriched in ^{16}O ($\delta^{17,18}O_{SMOW}$= ~ –50‰). These results are similar to those of AOAs from Y-81020 CO3.0 chondrite [3].

Straightforward interpretation of our petrographic and oxygen isotopic compositions in Semarkona AOAs shows no difference of those from CO3.0 chondrites.

In the future, we will analyse the Mg isotopic composition of AOAs and REE elements of LL3.0 AOAs in order to further compare these to AOAs from CCs (e.g. CO3.0 and CV3 chondrites) [3, 4].

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