TIMING OF CRYSTALLISATION OF THE MAGMA OCEAN ON THE HED PARENT BODY

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Asteroid 4 Vesta, the parent body of the howardite-eucrite-diogenite (HED) meteorites, is widely believed to be layered with a iron-rich core, an olivine-rich mantle and a crust made of diogenite in its lower part and of basaltic eucrite in its upper part [1-2]. Whether Vesta underwent a global or a partial melting is still debated. Two main scenarios were invoked to explain the formation of eucrites and diogenites. In the first scenario, they were formed before the core-mantle differentiation, with non-cumulate eucrites formed from the extrusion of the first partial melts from the silicates, followed by cumulate eucrites and diogenites formed by crystallization from a shallow magma ocean [3]. Conversely, the second scenario suggests that diogenites formed after the core-mantle differentiation, *via* crystallization of a global magma ocean [1] or in multiple smaller magma chambers [2], and that the residual liquid left behind after magma crystallization represents eucrites. However geochemical arguments, such as the depletion of moderately siderophile elements in HED [4], seem to favour the latter scenario.

We have re-investigated this issue by measuring the bulk mass-independent ^{26}Mg isotopic compositions (Δ'^{26}Mg) of three diogenites (Johnstown, Tatahouine and Shalka) and six basaltic eucrites (Cumulus Hills 04049, Elephant Moraine 87520, Queen Alexandra Range 97053, Béréba, Stannern and Juvinas). The eucrites show radiogenic Δ'^{26}Mg up to +30 ppm, while the diogenites are much less radiogenic with Δ'^{26}Mg values down to -6 ppm and scaling with the bulk CaO content of the diogenite. Overall our data are consistent with the range of bulk Δ'^{26}Mg variations described by Schiller et al. for diogenites and eucrites [5].

For the first time to our knowledge, we will use the Δ'^{26}Mg of diogenites and eucrites to show that they do not support the Neumann et al. model, but instead supports the formation of diogenites prior to the formation of eucrites. We will also compare our ^{26}Al model ages for dio-genites and eucrites to Al-Mg ages from literature [5-7], as well as whole rock Hf-W ages [8] and Mn-Cr ages [9] for HEDs.

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