

## Crystallization and cooling conditions for the diogenite formation in the turbulent magma ocean of the asteroid 4 Vesta

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The asteroid 4 Vesta has been completely differentiated to core and mantle despite its small size, of which surface materials are howardite-eucrite-diogenite (HED) meteorites that we know the detailed petrology, and therefore, is a good target for understanding differentiation of terrestrial planets. A new differentiation model for crust formation was developed by taking magma ocean fluid dynamics, chemical equilibrium, presence of <sup>26</sup>Al, and cooling into consideration with special care to crystal separation. The role of crystal size, thickness of the conductive lib, and fO<sub>2</sub> are evaluated as parameters. Large crystals (1cm) settle and form a km-thick cumulate layer of orthopyroxene with Mg# of 0.70-0.90 in 20 thousand years, which almost agrees with the Mg# of diogenites, whereas thinner layers are formed if the grain size is smaller.

Keywords: magma ocean, Asteroid 4 Vesta, HED meteorites