THE GEODYNAMICS SEMINAR

№655

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Venue: Meeting Room #486

Science Research Bldg. 1, 4th floor.

Ehime Univ.

Ferric iron content of majorite coexisting with reducing melt: Implications for Mars

Constraining the $Fe^{3+}/\Sigma Fe$ ratio of mantle minerals crystallized from a magma ocean that equilibrated with metallic iron is essential for understanding the initial distribution of Fe^{3+} and oxygen fugacity (fO_2) in terrestrial planetary mantles, such as Mars and Earth. We experimentally determined the $Fe^{3+}/\Sigma Fe$ ratio of majorite coexisting with a metal-saturated silicate melt at 18 GPa, corresponding to the base of the Martian mantle. Our results show that the $Fe^{3+}/\Sigma Fe$ ratios of 0.11–0.21 in majorite are higher than those of upper-mantle minerals and coexisting silicate melts at equivalent fO_2. These findings indicate that magma ocean crystallization forms a Fe^{3+} reservoir in the deep Martian mantle. Our results suggest that upwelling mantle material containing Fe^{3+}-rich majorite may contribute to the formation of relatively oxidized surface magmas recorded in Martian meteorites.

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