

Formation mechanism of the lunar highland crust indicated by correlation between Mg# and Th content

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Mg# (Mg/[Mg+Fe] in mole percent in mafic minerals) is a key geochemical parameter of lunar highland rock for addressing the crustal formation process because it provides the degree of differentiation of the magma ocean at the time of its solidification. In a previous study, we reported the Mg# distribution of the lunar highlands by using spectral data obtained by Kaguya, which clearly indicates a dichotomic distribution, with a higher Mg# in the far-side highlands than in the near-side highlands. A simple yet plausible model for interpreting the observation is dichotomic crustal growth from the magma ocean (the farside crustal material solidified from a less evolved magma than did the nearside crustal material). Th abundance data obtained by Kaguya also suggested similar solidification of the highland crustal material (less evolved on the farside than on the nearside).

This study investigates the correlation between the Mg# and Th abundances of the lunar highland crust of the same area by combining Kaguya spectral and gamma-ray data to check the validity of the previous interpretation derived by the Mg# and Th abundances of the highland material.

The results indicate a weak negative correlation of the Mg# decrease with increasing Th abundance, which is consistent with a prediction based on the magmatic evolution process. This result confirms the suggested process based on the individual observation (Mg# and Th abundances) of the highland formation of the farside material solidifying earlier than did the nearside material.

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