Laboratory reflectance spectral analysis of ilmenite to estimate the distribution of ilmenite at the lunar surface

*Moe Matsuoka[1], Satoru Yamamoto[1]

1. National Institute of Advanced Industrial Science and Technology

Ilmenite ($FeTiO_3$), enriched in lunar mare basalt, is one of important components to be determined its distribution and content on the lunar surface to understand the formation and evolution processes of the Moon, and the property of past lunar magma ocean. The visible and near-infrared reflectance spectra of ilmenite show low reflectance and absorption bands at ~0.25 μm (due to Ti^{4+}-O and Fe^{2+}-O charge transfer), ~0.335 and 0.54 μm (due to Fe^{2+}-Ti^{4+} charge transfer), at ~0.63 μm (due to Ti^{3+}-Ti^{4+} charge transfer), at ~1.3 and 1.6 μm (due to Fe^{2+} crystal field splitting), and, as a result, a sharp positive peak at around 0.95 μm (Izawa et al., 2021). On the lunar surface, spectral data observed by Spectral Profiler onboard Kaguya (SELENE) show a weak peak at ~1 μm in several regions, which is consistent with data obtained by Multiband Imager on board Kaguya (SELENE) (Yamamoto et al., 2023). Ground-based observations consistently reported that ~1-μm peak exists at Taurus-Littrow and Rima Bode (Gaddis et al., 1985).
On the lunar surface, ilmenite is estimated to exist as a mixture with other minerals such as augite. To cralify the distribution of ilmenite on the lunar surface, it is important to clarify the effect of ilmenite content on spectral features. In this study, we perform laboratory spectral measurements using powdered ilmenite and augite samples at various mixing ratios to clarify the relationship between ilmenite content and spectral features.

Keywords: Moon, ilmenite, reflectance spectra

