

## Simulation of space weathering with mixture lunar-like composition

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Space weathering is an effect that changes an optical property of mineral when surface of asteroids or airless-bodies are exposed to the space for long time. Space weathering makes reflectance spectra redder (steeper), darker and weaken absorption bands.

Such changes are caused by the production of nanometer-sized iron fine particles created by the reduction of iron ions containing in the mineral on airless body's surface. Due to the impact of micrometeoroids, irradiation of the solar wind, and irradiation of the cosmic ray iron ions are reduced and nanometer-sized iron fine particles are produced, then optical property changed.

The degree of space weathering varies depending on various factors such as the mineral composition, its particle size, a distance from the sun, and so on.

Plagioclase which is abundant on the lunar surface is little affected by space weathering. Plagioclase contains small amount of olivine, however lunar surface weathered much. In this study, mixtures of plagioclase and olivine is used as samples, and the space weathering of the lunar surface was simulated by irradiation with a nanosecond pulse laser, and the reflectance spectra was measured with a spectrometer(250-2500nm).

In data analysis such as remote sensing, it is important to consider the influence of its phase angle (observer-object-light source). The reflectance changes depending on the phase angle.

To assess the degree of the phase angle dependence, we measured the samples which are the mixtures of olivine and plagioclase and these irradiated by laser under the 12 different phase angle conditions. As a result, redness due to an increase of the phase angle was observed.

This effect also needs to be considered in the same way as reddening by simulation of space weathering.

Keywords: Space weathering, Reflectance spectra, lunar-like composition