

Simulation of Space Weathering by Irradiation of Nanosecond Pulse Laser and Proton Beams

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To simulate the surface alteration process "space weathering", experiments of pulse laser irradiation and proton implantation were performed. Heating by micrometeorite impacts were simulated irradiation of pulse laser beam whose pulse duration is 6-8 nanoseconds, comparable with impact timescale. Decreases of olivine reflectance were larger than that of pyroxenes. Absorption band depth did not change in the scaled spectra. Olivine spectrum after the irradiation matched spectra of some olivine asteroids. Comparison of Vesta spectrum with altered pyroxene spectra suggests that Vesta surface would be relatively older than olivine asteroids. Although proton implantation causes small changes in olivine and enstatite spectra, it does not influence the spectral change by the laser irradiation.