Laboratory simulation of space weathering: Formation of nanophase particles and the microscopic study

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The missing link between reflectance spectra of ordinary chondrites and S-type asteroids is considered to be caused by space weathering, where dust impacts change optical properties of regolith surface of asteroids. To simulate this effect, fine-grained pellet samples of main asteroidal constituent minerals were irradiated by a pulse laser beam in a few nano seconds. To clarify microscopic process and cause of reflectance change, the samples were investigated by TEM. Irradiated grains are coated by 100-200nm amorphous rim which is probably formed by vapor deposition. In rim region of irradiated grains samples, nanophase particles of metal iron are widely spread. These iron particles are very similar to nanophse particles found in the rim of lunar soils.