

## Space Weathering on Mercury: Effect of Impact Mixing and Weathering of Anorthite

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Space weathering is considered to explain optical property changes such as darkening, reddening, and attenuation of absorption bands on the surface of airless silicate bodies. The space weathering should be caused by the formation of nanophase metallic iron particles in amorphous surface coatings from the deposition of ferrous silicate vapor, which was formed by high velocity dust impacts as well as sputtering by solar wind (Hapke et al., 1975). Then, nanophase iron particles have been confirmed in the soil coating of lunar samples (Keller and McKay, 1993).

Experimental studies primarily using pulse laser showed the formation of nanophase iron particles on the surface should control the spectral darkening and reddening (Sasaki et al., 2001, Kurahashi et al., 2002, Noble et al., 2007). Mariner 10 showed and MESSENGER confirmed that Mercury has more impact craters associated with bright rays (and ejecta) than the Moon. The space weathering rate on Mercury might be slower than that on the Moon, although dust flux and solar wind flux causing the weathering should be one order of magnitude of greater on Mercury than on the Moon (Sasaki and Kurahashi, 2004). Growth of size of nanophase iron could have lowered the weathering degree (Noble et al., 2002).

The difference of weathering rate would be explained simply by compositional difference. The other possibility for attenuating space weathering on Mercury would be deeper mixing depth. The surface mixing by impacts on Mercury is greater than that on the Moon, because of higher impact flux and velocity of incoming meteoroid bodies.

The difference of space weathering between the Moon and Mercury might be also due to the compositional effect. Mercury surface is considered to be plagioclase-rich like the highland of the Moon. We started experimental simulation of space weathering on Mercury using anorthite samples. Although pure anorthite is in lack of iron, addition of iron-bearing material could alter the anorthite reflectance.