Variation of visible spectral reflectance due to surface conditions of simulated asteroid regolith surface

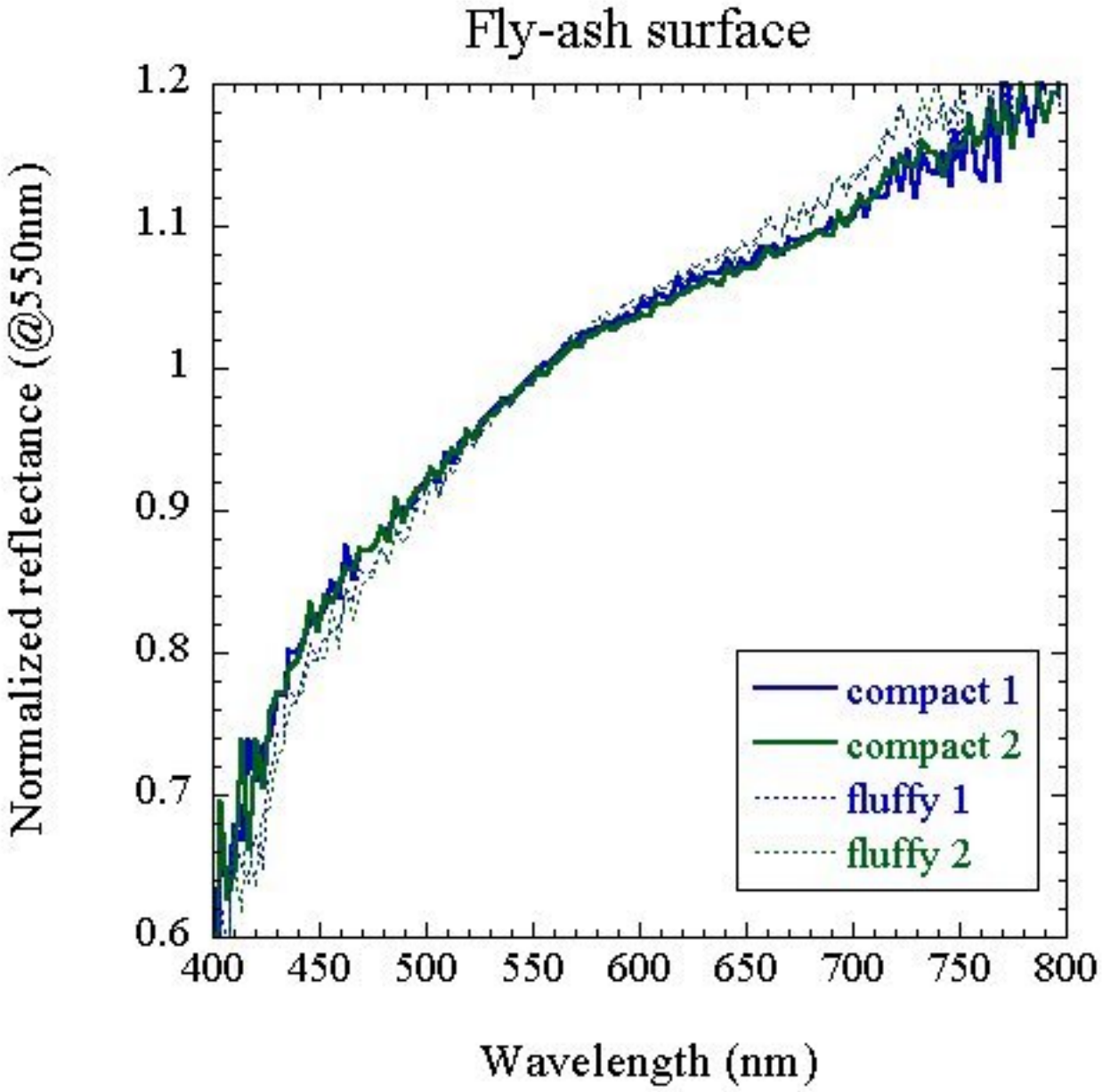
Tatsuya Sakai[1], Akiko Nakamura[2]

[1] Graduate School of Sci. and Tech., Kobe Univ., [2] Grad. Sch. of Sci. and Tech., Kobe Univ.

In recent years, various information about asteroids has been acquired by asteroid observations using spacecrafts etc. It was known that reflectance and spectrum of the light scattered by regolith surface change with the surface composition, and that the absolute reflectance changes with the diameter of regolith particles and the degree of compaction of the surface (Capaccioni et. al. 1990, Shkuratov et. al. 2002). We have performed a laboratory experiment in which we investigated how the reflectance depends on the surface conditions by quantifying the roughness and porosity of the powdery layers (Sakai, Tomita and Nakamura 2003). Although, it was also known that the spectral reflectance is dependent upon the surface conditions (Adams and Filice 1967), quantitative study of this effect has not yet been done. Thus, it is expected that the more detailed information on asteroids can be derived by studying the more parameters of the surface together with the surface composition.

This time, we have done laboratory experiments on the visible spectra of powdery surfaces that simulate the asteroid surfaces, and investigated quantitatively how the reflectance spectra changes with the surface roughness and the porosity. We report how the changes in spectra are influenced by the material composition of the powders.

Adams and Filice (1967) showed that increasing the porosity of powdery surfaces of silicate rocks reddens the visible spectra. We confirmed the same trend in our result on fly ash powders (45% SiO_2 is included) (the following figure). But this effect was not seen in the surface of iron powders. Then, we will discuss on the effect of the material composition, surface roughness, and porosity of the surface on the reflectance spectra.


Fly-ash surface
Normalized reflectance (@550nm)
Wavelength (nm)
1.2
1.1
1
0.9
0.8
0.7
0.6
400
450
500
550
600
650
700
750
800
compact 1
compact 2
fluffy 1
fluffy 2