FeO and TiO2 contents of lunar nearside by ground based spectral observations and the classification of mare lava flow

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Lunar mare is basaltic lava consisting of pyroxine and olivine rich in iron and titanium. The age of mare volcanism and the depth of its magma source are classified by titanium contents. Lucey et al. (1997) developed the method to estimate FeO and TiO2 contents using Clementine UV/VIS images. Their method is applied to the ground observation of lunar surface. Then, FeO map and TiO2 map are developed, in order to understand the distribution of mare lava and the difference of constituents.

Ground observational systems of the lunar surface consist of refracting telescope (Takahashi FS-102), cooling CCD camera (SBIG ST-7E), and narrow band-pass filters. The bands of filters of 415nm, 750nm, and 950nm, are the same wavelengths with the ones of Clementine UV-VIS camera, which are applied to investigate FeO and TiO2 contents of maria, by Lucey et al. (1997). The flat field correction, the atmospheric correction, and the geographic correction are applied to these observed spectral images. Then, they are mosaiced in each spectral wavelength. The photometric correction of Pieters et al. (1995) is applied to these mosaiced images and then finally bi-directional reflectance maps are developed. FeO and TiO2 maps are developed applying the method of the estimate of FeO and TiO2 contents of Kodama and Yamaguchi (2000) to these images. In order to understand the accuracy of our observation systems, estimated FeO and TiO2 contents of Apollo and Luna sampling sites in these maps are compared with these of Apollo and Luna sampling.

The results indicate that the defferences of FeO contents are less than 0.7% and those of TiO2 contents are less than 1.7% in Apollo11, 15, 17 sampling sites. In Apollo12, 14 sampling sites whose incident angle are less than 10 degree, Lommel-Seeliger low used by Pieters et al. (1995) is not applied to these sites, so the defference become +2~6%, and +2~4%, respectively. In the same reason, in Luna 16, 20, 24 sampling sites whose incident angle are more than 84 degree, the defference is +4.5 and +1.7 in maximum, however, these are less than the result of Saiki (2000).