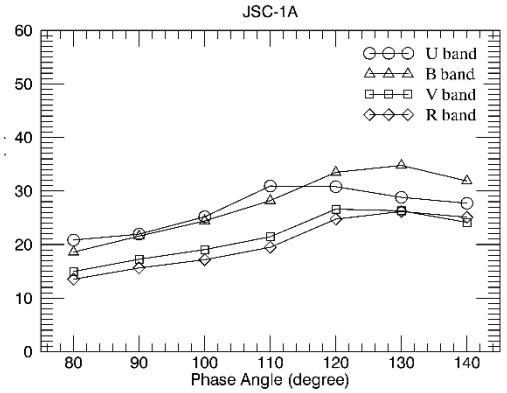
MULTI-BAND POLARIMETRY OF LUNAR REGOLITH MATERIALS IN LABORATORY. Il-Hoon Kim, Minsup Jeong, Chae Kyung Sim, Kilho Baek, and Sungsoo S. Kim, Dept. of Astronomy & Space Science, Kyung Hee University, Yongin, Gyeonggi 17104, Korea.

Introduction: To understand the polarization characteristics of the lunar regolith, we have carried out multi-band (U, B, V, and R passbands) polarimetric measurements. Powders of the four materials that are found in the lunar regolith (SiO2, Fe2O3, Al2O3, CaO) and JSC-1A, the lunar soil simulant, were considered. Although numerous laboratory measurements have dealt with powdered volcanogenic products and chemicals (*e.g.*, [1-3]), their laboratory environments such as the preparation methods of the materials, observing wavelengths, the light source simulating the sunlight are quite different from each other. In this work, we carried out multi-band polarimetric measurements of five materials in a consistent way.

Laboratory Measurements: We prepared powders of four materials (SiO_2, Fe_2O_3, Al_2O_3, CaO), which compose a large percentage of the lunar regolith, size-sieved silicon carbide (SiC) in three different sizes ranging from 12.7 μm to 127 μm, and the lunar soil simulant JSC-1. Powdered sample was placed on a black tray between the lighting unit and the imaging unit. The phase angle (*i.e.* the angle lamp–sample–camera) is acquired by adjusting the positions of the lighting unit and the imaging unit keeping a fixed 110 cm distance to both directions.

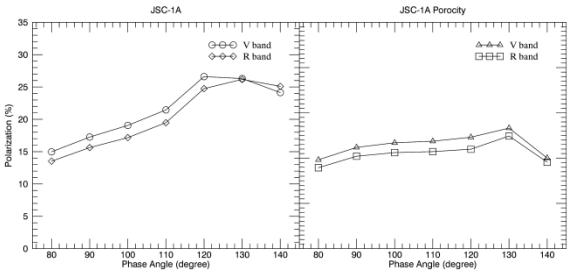
A 3800K white lamp and a depolarizer compose the lighting unit. The imaging unit, CCD camera, color filter set and polarization filter are identical to those used in the ground-based observations on the moon by [4].

For each material, we have measured the degree of polarization as a function of phase angle at U, B, V, and R passbands. We also obtained albedo of each material at phase angle of 90°.



The degree of polarization increases when the phase angle (α) is small, reaches its polarization maximum P_{max} at α_{max} ~ 110°-130°, and then decreases. We note that α_{max} is smaller in U band. The polarization phase curves show plateau-like features around α_{max}.

We also carried out the same measurements for different porosities. We achieved higher porosity by pouring the material very slowly through three separate sieves placed vertically with some gaps. We find that higher porosity results in smaller degree of polarization and that such a change is larger when α is larger..



References: [1] Clarke, D. (1965) *MNRAS, 130*, 83C. [2] Coffeen, D. L. (1965) *AJ. 70*, 403-413. [3] Pellicori, S. F. (1969) *AJ, 74*, 1077-1072. [4] Jeong, M. (2015) *this workshop*.