EPSC Abstracts
Vol. 11, EPSC2017-338, 2017
European Planetary Science Congress 2017

Spectro-polarimetry of fine-grained ice and dust samples measured in the laboratory

O. Poch (1), R. Cerubini (1), H. M. Schmid (2), A. Pommerol (1), N. Thomas (1), N. Carrasco (3, 4), C. Szopa (3)

(1) NCCR PlanetS and Physikalisches Institut, University of Bern, Switzerland (olivier.poch@gmail.com),
(2) NCCR PlanetS, Institute for Astronomy, ETH Zurich, Switzerland
(3) Université Versailles St-Quentin; Sorbonne Universités, UPMC Univ. Paris 06; LATMOS, CNRS, France
(4) Institut Universitaire de France

1. Introduction

Many objects of the Solar System have been observed in polarized light [1]. The polarization of the light is very sensitive to the size, morphology, porosity and composition of the scattering particles. As a consequence, polarimetric observations could significantly complement observations performed in total light intensity, providing additional constraints to interpret remote sensing observations.

2. Methods

Here, we present measurements performed in the laboratory of the University of Bern on carefully characterized ice/dust samples to provide reference spectro-polarimetric data. We use a Stokes polarimeter to measure the Stokes parameters describing the polarization of the visible light scattered by ice/dust samples illuminated with a randomly polarized light simulating the star light. The polarization is retrieved at multiple phase angles (1.5-30°) and wavelengths (400-900 nm), allowing to study the shape of the polarimetric phase curves and their spectral dependence. We are performing these measurements on surfaces made of water ice particles having different grain sizes and porosities, as well as mineral/organic dusts, pure or mixed together, as analogues of planetary or small bodies surfaces.

3. Results

For example, Figure 1 shows the degree of polarisation in the light scattered by a flat layer of *tholins* particles, analogues of extraterrestrial complex organic matter, produced from a gas mixture of N_2:CH_4 (95:5) at LATMOS [2]. These tholins are brown-coloured spherical particles of about 300 ± 200 nm. We found that their polarization phase curve strongly depends on the wavelength: the negative branch of polarization is much broader at 530 nm −a wavelength close to the size of the particles, than at 625 and 810 nm. This observation indicates that spectro-polarimetry can be a tool to infer the size of coloured particles.

These results provide interesting inputs to complement theoretical models and predict or interpret spectro-polarimetric properties of Solar System objects and eventually circumstellar disks.

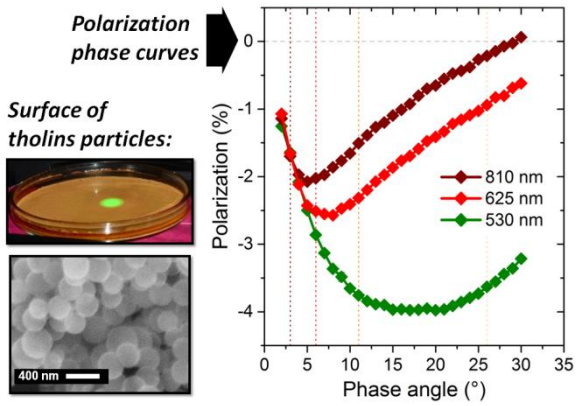

Figure 1: Example of spectro-polarimetric measurements on a surface of *tholins* particles.

Acknowledgements

The authors thank the National Center for Competence in Research ‘‘PlanetS’’ of the Swiss National Science Foundation for funding this project.

References

[1] Kolokolova, L., Hough, J., Levasseur-Regourd, A-C., (2015), Polarimetry of stars and planetary systems, Cambridge University Press, 2015

[2] Carrasco, N., *et al.*, (2009), Chemical characterization of tholins: Solubility, Morphology and Molecular Structure revisited., *J. of Phys. Chem. A* 113, 11195-11203.