Studying Titan's Aerosols by Characterizing Laboratory Analogues Properties: Optical Properties of Tholins and Relevant Key Questions for Titan's Environment

P. Coll[1], S.I. Ramirez[2], O. Poch[1], A. Buch[3], Y. Benilan[1]and F. Raulin[1]

[1] *LISA, UMR 7583, IPSL, Universités Paris Diderot & Paris Est-Créteil, France*
[2]*Centro de Investigaciones Quimicas, Universidad del Estado de Morelos, Cuernavaca, Mexico*
[3]*Laboratoire de Génie des Procédés et Matériaux, Ecole Centrale Paris, Chatenay-Malabry, France*

Titan, the largest satellite of Saturn, is one of the planetary bodies of Astrobiological interest in our Solar System. What is know for Titan's environment has been revisited since the exploration of the system of Saturn by the Cassini-Huygens mission, nevertheless the determination of the optical constants of the atmospheric organic aerosols are still of first importance, especially in the frame of the radiative transfer in Titan's atmosphere.

As predicted by Mc Kay et al. in 2001, *the optical properties of the haze in the 1 to 3 µm spectral region and the implications for the visibility of the surface are probably the most pressing current research questions*. This assertion is still valid in 2010.

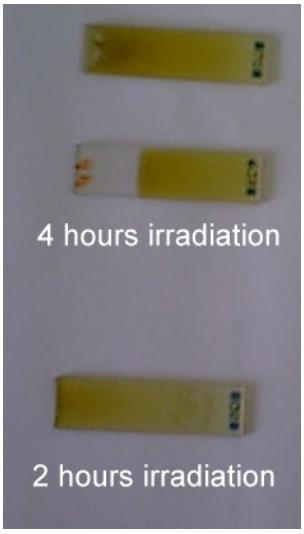

Figure 1 : view of different films of tholins used for optical characterization. These samples have been obtained by depositing organic aerosol particles on a quartz plate inserted in a plasma flow, where the particles are in situ synthesised.

We will then present in this paper optical characterizations of different tholin samples, synthesized via diverse methods. Some have been studied by ellipsometry followed by computation, others via a new device allowing the experimental determination of scattering matrices of particles at visible wavelengths. The scattering matrix allows us to perform multiple scattering calculations i.e. to study the effect of such aerosols in the radiative balance of Titan. We need also to obtain the refractive index of Titan's tholins, which is currently estimated with an important error bar (in the order of 30%).

Implications of these results and future work to be carried out will be discussed.