LOW TEMPERATURE ALKALINE PH HYDROLYSIS OF OXYGEN-FREE TITAN THOLINS: CARBONATES IMPACT. **C. Brassé**[1], A. Buch[2], F. Raulin[1] and P. Coll[1], [1]Université Paris Est Créteil et Paris Diderot, Laboratoire Inter-universitaire des Systèmes Atmosphériques, UMR 7583, Créteil, France (coralie.brasse@lisa.u-pec.fr, [2]Ecole Centrale Paris, Laboratoire de Génie des Procédés et Matériaux, Chatenay Malabry, France.

The largest moon of Saturn, Titan, is known for its dense, nitrogen-rich atmosphere. The organic aerosols which are produced in this atmosphere are of great astrobiological interest, particularly because of their potential evolution when they reach the surface and may interact with the putative water-ammonia cryomagma[1].

In this context, the aim of this study is to follow the evolution of organic material produced under alkaline pH hydrolysis of Titan tholins (synthesized by an experimental setup using a plasma DC discharge named PLASMA) at low temperature.

A recent study shows that Titan's subsurface water ocean may contain a lower fraction of ammonia (about 5wt% or less[2]), than the one usually used until now in this kind of experimental study[3, 4]. Thus, we have carried out new hydrolysis experiments which take this lower value into account.

In addition, recent model studies have provided new highlights on the bulk composition of Titan for various gas species. Indeed, the observed Saturn's atmosphere enrichment constrains the composition of the planetesimals present in the feeding zone of Saturn during the formation of Titan. The enrichment in volatiles in Saturn's atmosphere has been reproduced by assuming the presence of specific gas species[5, 6], in particular CO_2 and H_2S. In the present study we assumed that those gas species have been trapped in the likely internal ocean. Then by taking into account the plausible acid-base properties of the water-ammonia ocean, we determined a new probable composition of the cryomagma where hydrogenosulfide and carbonate anions are among the most abundant minor species. Assuming that this cryomagma could potentially inteact with deposited Titan's aerosols,we included these species in our hydrolysis experiments.

Previous experiments have revealed a possible oxygen contamination of these tholins during their preparation and/or sampling[3]. Following these preliminary studies the protocol of tholins production has been improved by isolating the whole device in a specially designed glove box which protects the PLASMA experiment from the laboratory atmosphere. We confirmed the non-presence of oxygen in the tholins produced within the new experimental conditions, and then we performed alkaline pH hydrolysis of these oxygen-free tholins by taking into account the new data described beforehand.

In this purpose, four different hydrolyses have been applied to oxygen-free tholins. For each type of hydrolysis, we also followed the influence of the hydrolysis temperature on the organic compounds production. The obtained results show the formation of many organics. Among them, several species are produced only when carbonates are present. In addition, a list of potential precursors of these compounds has been established which could provide a database for studying the chemical composition of tholins and, consequently of the aerosols of Titan.

References:

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