

Key positive ion precursors to tholin formation. D. Dubois¹, N. Carrasco^{1,2}, L. Jovanovic¹, J. Westlake³, L. Vettier¹, T. Gautier¹ ¹LATMOS, Université Versailles St-Quentin, UPMC Univ. Paris 06, CNRS, 11 blvd d'Alembre, 78280 Guyancourt, France (david.dubois@latmos.ipsl.fr), ²Institut Universitaire de France, 103 bd Saint-Michel, 75005 Paris, France, ³Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, USA.

Introduction: In Titan's upper atmosphere, Cassini detected mass signatures compatible with the presence of heavily charged molecules which are volatile precursors to the solid core of the aerosols. INMS measurements revealed molecular groupings of masses below 100 amu, while CAPS-IBS saw positive ions up to ~350 amu, well beyond the INMS detection limit. Photochemical processes are also influenced by dayside vs. nightside conditions, with photoionization dominating the dayside. From a dynamical and transport viewpoint, the ion densities were also found to be sensitive to modeled turbulent neutral transport. A previous laboratory study has also explored the influence of trace species on the first and intermediate steps of the neutral and positive ion chemistry, in hydrocarbon-enriched mixtures. Furthermore, models have indicated that primary production processes and ion-molecule reactions mainly control the production of the lighter and subsequent heavier positive ions. These reactions rely on the large abundancies of hydrocarbon building blocks (e.g. C₂H₂ and C₂H₄). These observations indicate that ion chemistry has an important role for organic growth in the upper atmosphere. However, the processes coupling ion chemistry and the formation of larger tholins have yet to be further explored. In this study, we investigate the positive ion chemistry in the laboratory, responsible for the efficient organic growth producing tholins, simulated in the PAMPRE plasma reactor. We use a RF-generated plasma at 1 mbar pressure, coupled with an ion mass spectrometer, probing the gas phase volatiles *in situ*. We study N₂:CH₄ mixtures with 1-10% CH₄ mixing ratios, and investigate the impact of light ions on the larger ones. We further compare our results to Cassini Ion and Neutral Mass Spectrometer (INMS) measurements taken during the T40 flyby.

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