Anion Chemistry on Titan: A possible route to large hydrocarbons

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Résumé

Cassini CAPS-ELS spectrometer revealed the presence of large negative ions in the ionosphere of Titan [1]. Recently, a mechanism has been proposed for the possible formation of these ions, in whith the cyanoacetylene, HC3N, played a key role [2]. Chemical ionization technique (NCI and APCI-) were used successfully to prepare model complex (HC3N)x. CyN- anions in the gas phase. The reaction itself and CID experiments was studied using a Waters Quattro Premier TM tandem quadruple mass spectrometer operating in negative ion mode and VG ZAB2-SEQ mass spectrometer. CID mass spectra of these anions, as well as their ion molecule reactions with HC3N support the previously proposed reaction scheme [2,3]. Quantum chemistry calculations revealed details of the ion structures, energetics and reaction mechanisms. High-energy CID spectra of (HC3N)x. CyN- anions showed a complexity of ionic and neutral products that can be expected to be formed by the high-energy ion precipitation observed at Titan [4].

Presented experiments show that in spite of its low abundance in Titan atmosphere [5], the cyanoacetylene is probably one of the most important species in the ionospheric chemistry of Titan.

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Figure 1. Pressure dependent mass spectra of reactions of CxN- anions (x =3,5,7,9) with HC3N

References

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