

# **STUDY OF ELECTRICAL DISCHARGE INITIATED CHEMICAL PROCESSES IN TITAN RELATED ATMOSPHERE AT LABORATORY AND RELEVANT TEMPERATURE AND PRESSURE**

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## **Abstract**

The chemical processes initiated by electrical discharges in prebiotic atmospheres became a hot topic during the last decade because of recently extensive discovering of exo-planets. The biggest atmospheric data collection is currently available about atmosphere of Saturn's moon Titan that is composed mainly from nitrogen and methane at low surface temperature of about 95 K and pressure of about 1.5 atmospheres. The presented work deals with the laboratory simulation of the electrical discharge initiated chemical processes in the Titan related atmosphere nitrogen-methane gaseous mixture. Beside results under laboratory conditions this contribution also gives the first measurement of the main compounds formed at the liquid nitrogen temperature at pressure of 1.5 atmospheres. The ongoing chemical processes, the resulting stable products and their transformation into more complex substances are studied by in situ mass spectrometry with proton ionization (PTR-MS) of the exhausting gas. A total of about 40 aliphatic hydrocarbons, cyano and amino compounds have been successfully identified and some aromatic compounds at higher methane concentrations were synthesized, too. Increasing concentrations of methane have produced more substances with higher molecular weight and less simple substances that were likely to be consumed on more complex substances formation. The pilot experimental data under the liquid nitrogen temperature and pressure 1.5 atm demonstrated the important role of temperature which has a significant impact on creation of heavy molecules as well as for the formation of molecules that can be the life precursors (like formamide). Since the area of the possible creation of the building blocks of life has not yet been thoroughly explored, it carries a wide range of possible experiments and has enormous potential for the discovery of new mechanisms.

## **Keywords**

Titan moon, origin of life, proton transfer time of flight mass spectrometry, exoplanetary atmospheres, electrical discharge.