Report on the outcomes of the TNA visit

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During the TNA visit an FTIR spectrometric study of products formed in a gliding arc discharge fed by a various mixture of CH_4 in N_2 (0.5, 1, 1.5 and 2 % of CH_4) was carried out in a flowing regime for various flow rates in range from 50 to 200 sccm, at room temperature and atmospheric pressure. HCN was found to be the most dominant product at wavelength 713 cm^{-1} (Fig. 2). The other major products was NH_3 (967.1 cm^{-1}) and C_2H_2, has been also found in traces (729 cm^{-1}). With increasing power the product concentrations also increased (Fig 3). AS it was expected, the gas flow rate significantly influenced the discharge productivity.

The novelty in our results was the detection of NH_3, which has not been detected in non-catalyst experiments in our earlier corona discharge studies. Further analysis will provide some novel insights into the chemical and physical mechanisms prevalent in Titan's atmosphere and assist in the interpretation of results from the Cassini-Huygens space mission.

Designing and modifying a hybrid reactor for a "packed bed DBD" regime

A hybrid (DBD, gliding arc and corona) discharge reactor chamber has been built of commercial CF flanges equipped with multi-way gas outlets and sapphire viewport for FTIR, GC-MS and CCD spectroscopical analysis. By this way the reactor body could be then placed in a cooling bag fed with dry ice in order to reach temperatures close to Titan's conditions. The reactor is suitable to carry out experiments in both gas flowing and stationary regimes for various admixtures of CH_4 in N_2.
The advantage of this new reactor is buried in the changable electrode system used in the same chamber geometry, designed according to our experiences obtained in our earlier measurements, which have been made in different electrode geometries. Electrical parameters can be easily measured by oscilloscope, using HV probe and current probe connected to the chamber body and electrical feedthrough. Oscilloscope was recommended to be used due to the fast and dense microdischarge (nanoseconds) occurence in DBD regime, which habe been detected in our earlier measurements. Solid samples formed in the reactor chamber will be analyzed using FTIR-ATR and SEM-EDX surface analysis methods.