

# Paper Spray Ionization Under Harsh Environment and Gas Phase Ion Molecule Reaction Under Titan Simulate Environment

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**Simulated Harsh Environment Ambient Ionization** : *in-situ* soft ionization using the lake liquids on Titan would reveal the chemical evolution of precipitated Titan haze aerosol and the organic identity of Titan soil. Using porous substrates, solvents of no polarity or extreme high viscosity were found to be amenable with electrospray type soft ionization. Analytes being ionized include: 1) polar, insoluble analyte deposited on the paper triangle; 2) functionalized soluble analytes dissolved in the non-polar solvents or deposited on the paper triangle; 3) non-functionalized hydrocarbons dissolved in the non-polar solvents or deposited on the paper triangle. In a parallel experiment, this type of experiment was successfully carried out at a temperature of -20 °C to simulate direct analysis of snow sample in field missions. **Simulated Atmospheric Ion Chemistry**: The presence of polycyclic aromatic hydrocarbons (PAHs) in Titan's atmosphere has been suggested by laboratory simulations and observations. PAHs are also believed to be among the most abundant and widespread organic compounds in the universe. Using collisional activation reactive PAH ions were generated by dissociation of precursor ions. The reaction took place in an ion trap filled with nitrogen (5 mBar, simulating the pressure of Titan's main haze layer) and the product ions were subsequently mass-analyzed downstream using an Orbitrap mass analyzer. A number of aryl cations were found to react by addition of molecular nitrogen. The reactivities were elucidated by high resolution mass spectrometry. And the fixed nitrogen were found to react with other reagent to form other functionalities.