Radiation Induced Chemistry on Icy Satellite Surfaces Embedded in Magnetospheric Plasma Environments of solar system – A New Experimental Facility at PRL

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Icy satellites, such as Io, Europa, Ganymede, Callisto and Rhea etc., are bombarded by energetic particles in the surrounding plasma produced in the Jovian and Saturnian magnetospheres. Plasma-satellite interactions via particles, with energies ranging from keV to MeV, process the icy surfaces of the satellites with varied chemical compositions. Indeed, such interactions also lead to chemical exchange between the satellites whilst altering the chemical composition of the surface ices. Recent findings from the space and ground based observations on the signatures of several new molecules reveal complex chemistry that is yet least understood under the conditions that are unique to the icy satellites of our outer solar system.

By performing laboratory based experiments, that simulate conditions prevailing in the icy satellites, chemical pathways that underpin formation of complex molecules on icy satellites can be revealed. The new experimental setup operated at Ultra High Vacuum (UHV) condition is equipped with a 30 KeV electron gun and a ZnSe substrate at 10 K, to form molecular ices, in order to simulate plasma-icy surface interaction. Non-equilibrium reactions initiated by keV particle interactions are probed in the mid-infrared (4000 – 400 cm^{-1}) region using a Fourier Transform InfraRed (FTIR) spectrometer. In this poster preliminary results and their implications to icy satellite surface chemistry will be discussed.