Seminar

Institute for Plasma Research

Title : Dissociative Electron Attachment in Condensed Phase

Speaker : Dr. Daly Davis
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Homi Bhabha Road, Colaba, Mumbai

Date : 3rd September 2014, Wednesday

Time : 03.30 PM

Venue : Seminar Hall, IPR

Abstract:

The interest in electron-induced chemistry has recently been renewed by the discovery that low energy electrons damage DNA[1] and by the increasing realization of its importance in plasma devices, nanolithography and astrochemistry. The observation of functional group dependence in dissociative electron attachment (DEA) in gas phase[2,3] has suggested its increasing potential for controlling the electron induced chemistry. In this case, selective bond breaking is possible by tuning the electron energy to the respective resonant energy. In addition, recent theoretical investigations have shown the role of low energy electrons (LEE) as catalysts in bond breaking through resonant attachment [4,5].

LEE irradiation experiments in pure ices condensed at cryogenic temperatures have attracted considerable interest within the last few years as a model that simulates the electron induced reactions in the interstellar [6] and biological conditions[7]. Indications of the functional group dependence could be seen in the electron induced desorption of negative ions from condensed molecular films[8]. However, in spite of copious studies available in gas phase DEA literature very few are available in condensed phase. This is mainly due to the inherent difficulties in condensed phase electron scattering experiment such as charge trapping, neighboring interaction etc. Moreover condensed phase electron-molecule interactions are different from gas phase. This is due to change in symmetry, induced polarization, molecule orientation and image charge etc. Hence, material developments with gas phase knowledge, e.g., chemical control via DEA, requires detailed understanding of condensed phase electron-molecule interactions.

This talk covers 1) the effect of neighboring interactions and charge trapping in condensed phase DEA. Condensed formic acid has been used for this study with Fourier transform Infrared spectrometer as the molecular probe. 2) The effect of molecular orientation and molecular phase will be explained by O^- desorption studies from amorphous and crystalline films of CO_2 using time of flight mass spectrometer

References

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