

Seminar

Institute for Plasma Research

Title : Mass spectrometric and Optical emission spectroscopic study of atomic and molecular clusters

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Date : 31st August 2018 (Friday)

Time : 10.15 AM

Venue : Committee Room 4, (New Building), IPR

Abstract :

Atomic and molecular clusters play an important role in many branches of science, such as, Atmospheric science, Space science, Material science, Surface science, Nano-technology, Astrochemistry, Astroplasma etc. Neutral and ionic clusters present in the atmosphere have a vital role for gas phase chemical reactions. Apart from the tremendous demand in fundamental and basic science research, clusters have increasing applications in technologies, such as, in controlling of surface properties, fabrication of micro structures on solid surfaces, miniaturizing components for modern day electronic industry. They are popularly used for preparing new classes of materials with modified optical, magnetic, chemical and photocatalytic properties. Clusters are also used as ideal catalysts in chemical industry. Thus, information obtained from cluster properties will be beneficial for basic science and applied research.

In order to investigate the dynamics of clusters exposed to intense pulsed laser, our primary requirement is the development of a cluster source to generate a beam of clusters. We are developing a cluster source based on laser ablation of solid target accompanied by a supersonic gas expansion. The beam of neutral clusters, thus generated, will be exposed to a pulsed laser beam leading to the production of cluster ions formed by Multi-Photon Ionization (MPI). In order to detect these heavy cluster ions, we have designed and developed in house a two field Time-Of-Flight (TOF) mass spectrometer. The testing and calibration experiment of TOF are ongoing with Xenon gas. In this talk, design and development status of laser ablation cluster source and TOF mass spectrometer will be discussed in detail.

Apart from the mass spectrometric studies, optical emission spectroscopy is employed as a diagnostic tool for investigating the optimum conditions of carbon cluster production in different configurations of laser ablated plasma plumes. Some interesting results obtained from the comparative investigation of carbon cluster formation in stagnation layer and in seed plasma plume under ambient gas environment will also be discussed in detail.
