

Seminar

Institute for Plasma Research

Title : Knowledge from Damage: Ion Beam Interactions with Surfaces and Molecules

Speaker: Prof. Lekha Nair
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Date : 28th August 2018 (Tuesday)

Time : 11.00 AM

Venue : Seminar Hall, IPR

Abstract :

The study of the interactions of ions with matter, which began as an attempt to understand the damaging effects of radioactivity and cosmic rays, has resulted in the development of a wide range of versatile materials modification techniques, the most well known being the several ion implantation steps involved in semiconductor processing. Seemingly contrary processes-such as beam induced amorphisation and crystallisation of embedded particles, reactivity and selective sputtering- can be induced by the ion beam, under appropriate conditions. In the last decade, synthesis and modification of elemental and compound nanostructures has become possible, taking advantage of the highly non-equilibrium conditions immediately following an ion's passage through matter.

The development of heavy ion accelerators has allowed the systematic study of the mechanisms responsible for the ion beam induced 'damage', and, while real time observation of the immediate effects of an ion's passage through matter is still not possible experimentally, modelling of these processes is becoming ever more accurate and has guided experimental investigations. Our recent work on ion beam induced formation of self organised metal nanostructures and a molecular dynamics approach that may be used to study such processes will be discussed.

One area where quantitative data on the immediate aftermath of ion interaction has become accessible is in atomic physics, where coincidence techniques such as the 'momentum microscope' allow the determination of the possible ways in which the components of a molecule undergo fragmentation and recombination to give novel molecular species such as H_3^+ , which are not typically expected to be seen, except in stellar environments. The development of a momentum microscope and the detection of mass and momentum resolved molecular fragments will be presented.
