Seminar

Institute for Plasma Research

Title : Study of tungsten surface morphology under deuterium ion irradiation and its dependence on fluence

Speaker: Dr. Asha
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Date : 7th January 2019 (Monday)

Time : 03.30 PM

Venue : Seminar Hall, IPR

Abstract :

The interaction of energetic particles with solids plays an important role in fundamental and applied research. The topic is quite important for fusion research as well. Energetic ions interacting with metals (either at surfaces or in bulk) of energies eV to MeV are responsible for the kinetics in solids by transferring energy via elastic or inelastic interaction depending on the nature of the material. Tungsten (W), owing to its properties is one of the potential candidate for future fusion devices to be used as armour material. In fusion devices, first wall material is exposed to neutrons having high energies (14 MeV) causing radiation damage. In the absence of high energy and flux neutron sources one has to use energetic ions to simulate the radiation damage.

One of the important problems is the erosion of armor material, especially when the surface morphology is heavily modified. In such situations, the changes in local thermal conductivity can cause local hot-spots and consequent erosion. In the present work, we look at the surface modifications (like formation of bubbles or such structures) when W is irradiated with D- ions. Pre and post ion irradiated (separately as well as sequentially) W surface under different mass and energy ions were studied. The important features are gaseous ions induce blisters, pits and widen grain boundaries, which could lead to enhance erosion. Gaseous atoms penetrating through W can be trapped at the defects or combine into molecules at voids, responsible for these surface entities. Blisters and cracking behavior strongly depend on energy, fluence and substrate temperature, during irradiation. Obtained experimental data suggest that the defects present beneath the surface are the main driving factor for the formation of blisters.