

Ion Irradiation Induced Modifications in Tungsten Foils

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The ion-solid interaction has fundamental importance and is a subject of evolving understanding for years. Energetic ions 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 is prime material to be used in future fusion devices because of its thermal and mechanical properties. In lieu of neutron irradiation, ion irradiation of tungsten is an active area of research.

To explore the surface morphological effects, energetic ions of various masses were bombarded on polycrystalline tungsten. Polycrystalline tungsten foils were procured from Princeton Scientific Corporation, USA as a starting material for our study. Tungsten foils of 0.1 mm thickness were mechanically polished and annealed at two different temperature (1373 and 1838 K) for minimizing the pre-existing defects. These foils were further irradiated with Au ions of energy 80 MeV. Further sequential irradiation with helium/Deuterium ions of energy 250/100 keV were done on same set of Au irradiated tungsten foils. Pre and post irradiation surface morphological studies were done with high resolution scanning electron microscope (FESEM). FESEM studies revealed the bubble formation and other surface morphological changes of tungsten foils due to gaseous ion irradiation. In D irradiated tungsten bubble formation is more at grain boundaries and in case of sequential irradiation with He pre irradiated with heavy ions, it is noticed that bubbles were seen at the foil surface. Statistical analysis is continuing and results will be presented during the meeting. Ion-irradiation in tungsten induces different and distinguishable modifications within bulk and on the surface. Four probe DC resistivity measurements were performed in a temperature range of 10 K to 300 K to study the overall defects in tungsten foils before and after irradiation. The correlation between Residual Resistivity Ratio (RRR) and the defects in the samples will be presented.

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