Radiation Damage in Tungsten used as Plasma Facing Material: Preliminary understanding through Literature Survey

Abstract

Abstract: Tungsten (W) is a primary candidate material for plasma-facing components in future fusion reactors due to its high melting point, excellent thermal conductivity, and low sputtering yield. However, its long-term performance is strongly influenced by irradiation-induced damage, particularly when exposed to high-energy neutrons and heavy ions. To better understand the fundamental mechanisms of defect formation and accumulation, this six-week academic project focuses on literature based preliminary study of irradiation damage in tungsten using neutrons and ions (as surrogates for neutron-induced displacement damage).

The study involves an extensive literature survey on neutron and ion irradiation of tungsten, with emphasis on defect generation, displacement per atom (dpa) evolution, cascade morphology, and microstructural changes such as void formation, dislocation loops, hardening and embrittlement.

The outcomes will give an understanding of how ion irradiation can effectively mimic neutron-induced damage within the near-surface region of tungsten.

Academic Project Requirements:
1) Required No. of student(s) for academic project: 1
2) Name of course with branch/discipline: B. Tech., Metallurgical and Materials Engineering
3) Academic Project duration:
Total academic project duration: 6 Weeks

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Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: B.E./B.Tech. Material Science/Engineering

3) Academic Project duration:

(a) Total academic project duration: 6 Weeks
(b) Student's presence at IPR for academic project work: WorkFromHome Full working Days per week

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