P 22: Plasma Wall Interaction/HEPP

Time: Thursday 16:15–17:35 Location: ZHG102

Invited Talk P 22.1 Thu 16:15 ZHG102

High-resolution optical emission spectroscopy of neutral W lines: comparing near-threshold sputtering of W with different crystal orientation in PSI-2 — •Marc Sackers[1], Oleksandr Marchuk[1], Stephan Ertmer[1], Sebastijan Brezinsek[1,2], Fredric Granberg[3], and Arkadi Kreter[1] — [1]Forschungszentrum Jülich GmbH, Institute of Fusion Energy & Nuclear Waste Management - Plasma Physics — [2]HHU Düsseldorf, Faculty of Mathematics and Natural Sciences — [3]University of Helsinki, Department of Physics

Seeding gas ions, like Ar, having a kinetic energy of ≈ 100 eV, dominate the erosion of the plasma-wetted areas during the quiet phases of the discharges in fusion reactors. These ions create near-threshold sputtering. Thus, the collisional cascade stays within the surface layers, and the distribution function of the sputtered atoms can depend strongly on the crystallographic structure. Molecular dynamics simulations suggest precisely such a behavior for the erosion of W by low-energy Ar ions.

However, experimental studies of the near-threshold erosion of tungsten by seeding gas impurities are severely lacking. This contribution presents near-threshold erosion experiments of tungsten samples by Ar ion bombardment at the linear plasma device PSI-2. The modeling of the line shape emitted by sputtered W provides, via Doppler broadening, insights into the angular and velocity distribution functions. This contribution presents how to account for all relevant line broadening and splitting mechanisms. Notably, the line shape measured depends strongly on the crystallographic plane exposed to the plasma.

P 22.2 Thu 16:45 ZHG102

Manufacturing and testing of optimized composite heat sinks for plasma-facing component applications — •Robert Lürbke[1,2], Alexander von Müller[2], Bernd Böswirth[2], Henri Greuner[2], Johann Riesch[2], Georg Schlick[3], and Rudolf Neu[1,2] — [1]Technical University Munich, 85748 Garching, Germany — [2]Max Planck Institute for Plasma Physics, 85748 Garching, Germany — [3]Fraunhofer Institute for Casting, Composite and Processing Technology IGCV, 86159 Augsburg, Germany

In future magnetic confinement fusion reactors, plasma-facing components (PFCs) of the divertor will be subjected to high heat loads and intense neutron irradiation. This requires the development of reliable materials and robust component designs. An established state-of-the-art divertor PFC design is the so-called tungsten monoblock concept, which exhibits good damage resilience but is restricted in its width requiring a large number of PFCs. The so-called flat-tile is another well-known design option, which exhibits good heat removal capabilities, but there are basic concerns about the structural integrity of the material joints. In this study, we demonstrate the manufacturing and testing of a design that combines the advantages of both abovementioned PFC design approaches with an optimized tailored composite. Such composite structures are manufactured by infiltrating additively manufactured tungsten preforms with a copper (alloy) matrix. The contribution summarizes the results of high heat flux tests on different PFC mock-up specimens that were tested under cyclic loading at heat loads up to 20 MW/m^2.

P 22.3 Thu 17:10 ZHG102

Engineering tool for the mitigation of target loads at leading edges in multi-configuration island divertors — •Antara Menzel-Barbara[1,2], Joris Fellinger[2], Rudolf Neu[1,3], Dirk Naujoks[2], and Michael Endler[2] — [1]TUM, Munich, Germany — [2]IPP, Greifswald, Germany — [3]IPP, Garching, Germany

The Wendelstein 7-X divertor is designed to intersect magnetic field lines at shallow angles. Because of inevitable steps between divertor components, small exposed areas called *leading edges* can be intersected almost perpendicularly by magnetic field lines and thus receive highly increased heat fluxes. Traditionally, mitigating leading edges involves tilting the divertor target or chamfering the problematic edges. However, as W7-X is capable of operating various magnetic configurations, this can lead to particle fluxes impinging from opposing directions on the same target surface, exposing new leading edges when mitigating one. The tool presented here allows to demonstrate that while such overlapping particle deposition patterns are manageable, achieving good separation is essential for relaxed tolerances and reduced manufacturing complexity. Furthermore, methods for achieving this separation are explored via field-line tracing creating divertor geometries from scratch for single configurations. By maintaining incidence angles below critical thresholds, overloads can be avoided. By identifying shadowed regions, divertor targets can be designed for compatibility with multiple configurations, while eliminating overlapping leading edges. It is envisioned to use this tool to explore divertor solutions optimized for particle exhaust, cost and ease of installation.