P 11: Poster Session- Plasma Wall Interaction

Time: Tuesday 16:30–19:00 Location: Empore Lichthof

P 11.1 Tue 16:30 Empore Lichthof

Study of the Temperature Dependent Nitrogen Retention in Tungsten Surfaces by XPS-Analysis — •Ulrike Plank[1,2], Gerd Meisl[1], and Till Höschen[1] — [1]Max-Planck-Institut für Plasmaphysik, Boltzmannstr. 2, D-85748 Garching — [2]Fakultät für Physik der Ludwig-Maximilians-Universität München, Schellingstraße 4, D-80799 München

To reduce the power load on the divertor of fusion experiments, nitrogen (N) is puffed into the plasma. As a side effect, nitrogen gets implanted into the tungsten (W) walls of the reactor and forms nitride layers. Their formation and, therefore, the N accumulation in W showed an unexpected temperature dependence in previous experiments. To study the nitrogen retention, we implanted N ions with an energy of 300 eV into W and observed the evolution of the surface composition by X-ray photoelectron spectroscopy (XPS). We find that the N content does not change when the sample is annealed up to 800 K after implantation at lower temperatures. In contrast, the N concentration decreases with increasing implantation temperature. At 800 K implantation temperature, the N saturation level is about 5 times lower compared to 300 K implantation. A possible explanation for this difference is an enhanced diffusion during ion bombardment due to changes in the structure or in the chemical state of the tungsten nitride system. Ongoing tungsten nitride erosion experiments shall help to clarify whether the strong temperature dependence is the result of enhanced diffusion or of phase changes.

P 11.2 Tue 16:30 Empore Lichthof

Emission of fast non-Maxwellian atoms at metallic surfaces in a linear magnetized plasma — •Sven Dickheuer, Oleksandr Marchuk, Christian Brandt, and Albrecht Pospieszczyk — Forschungszentrum Jülich GmbH, Institut für Energie- und Klimaforschung - Plasmaphysik, 52425 Jülich, Germany

The sheath between the unperturbed plasma and the plasma boundary plays a fundamental role in plasma research and is one of the most natural sources of fast non-Maxwellian atoms in plasmas. The considerable fraction of ions, accelerated in the sheath potential in front of an electrode, is reflected back as fast atoms. Recently we have observed fast D atoms in D-Ar mixed plasmas in the linear plasma device PSI-2. Studied by means of optical emission spectroscopy, the emission of fast D atoms appears in the spectrum as Doppler-shifted components of the Balmer-series [C.Brandt et al. O3.J107, EPS conference (2015)]. The Doppler-shift depends on the energy and particle reflection coefficients of the electrode material and its spectral reflectivity (roughness, e.g.). First results on the emission of fast H atoms for the target materials W, Fe, Pd, Ag and C are presented. We use a H-Ar mixed plasma and incident ion energies between ≈ 40 and 220 eV. The measurements are performed using lines-of-sights at different observation angles. The energy and angular distribution of the fast atoms are compared with the results from TRIM code calculations. In all cases, we have also obtained the data for the spectral reflection coefficient of the target materials. The results are tested against the reflectance measurements with light calibration sources and reference data.

P 11.3 Tue 16:30 Empore Lichthof

Photoionization using VUV-light emission from a helium microplasma jet — •Pascal Vogel, Mohamed Mokhtar Hefny, and Jan Benedikt — Group Coupled Plasma-Solid State Systems, Faculty of Physics and Astronomy, Ruhr-Universität Bochum, Bochum, Germany

Atmospheric non-equilibrium plasmas have been demonstrated to be effective in many treatments relevant for medical applications, for example in inactivation of bacteria, fungi, or viruses or in treatment of cancer cells. One of the important issues in understanding the plasma-cell interaction is studying the effects of reactive plasma components (radicals, ions, photons) separately. In this work we want to study the isolated effect of ions like Ar+, O2+, N2+ and NO+, which are generated in photo ionization reactions, on a bacteria or cells. The helium plasma jet emits VUV-light with excimer continuum emission in the range from 60 to 100 nm. The photons propagate through helium gas to a point, where an additional helium gas cross flow with a small admixture of Ar, O2, N2 or NO will cross. By photoionization, the additional gas is ionized and by the cross flow separated from the other plasma components. To analyze our experiments, we use a windowless VUV-spectrograph to measure the emitted spectrum and a pA-meter to measure the ion flux to a substrate. The results of these measurements and how the produced ions can be applied to biological substrates will also be presented.