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On Generation and Propagation of the Plasma Ion Beam for Plasma Ion Assisted Deposition (PIAD) of Optical Coatings¹ J. HARHAUSEN, Leibniz Institute for Plasma Science and Technology, R.P. BRINKMANN, Ruhr-Universität Bochum, R. FOEST, A. OHL, Leibniz Institute for Plasma Science and Technology, B. SCHRODER, Ruhr-Universität Bochum — PIAD is a technique employed for the production of high performance optical coatings. Here, the plasma source is a hot cathode direct current discharge with an auxiliary magnetic field (APS). Its specific design together with a low chamber pressure of $p \sim 2 \cdot 10^{-4}$ mbar results in the generation of energetic ions (typ. $E_i = 50.150 \,\mathrm{eV}$) impinging onto the substrates. Until today, data on the plasma parameters in the coating chamber is sparse. This contribution presents details on the energy distribution functions (EDF) of electrons and ions in the strongly inhomogeneous APS plume using Langmuir probe and retarding field energy analyzer diagnostics. The IEDF is characterized by two separate populations of low and high energy. An analytical model for the evolution of the ion beam reveals that the slow ion component is due to charge exchange of fast ions with the background neutral gas. This model is indispensable for the estimation of the NEDF.

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Jens Harhausen Leibniz Institute for Plasma Science and Technology

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