Abstract Submitted
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Student Award Finalist - The role of surface properties in the dynamics of radio-frequency plasma sheaths: measurements and simulations ARTHUR GREB, York Plasma Institute, Department of Physics, University of York, York, YO10 5DD, UK, ANDREW GIBSON, Centre for Plasma Physics, Queen's University Belfast, Belfast, BT7 1NN, UK, KARI NIEMI, DEBORAH O'CONNELL, TIMO GANS, York Plasma Institute, Department of Physics, University of York, York, YO10 5DD, UK — Plasma processing on an industrial scale is becoming increasingly complex and now demands new strategies for process metrology. Of particular interest is the energy transport in the interface region between non-equilibrium low-pressure plasma and the surface. Experimental measurements are coupled to a benchmarked 1D fluid model, with improved energy dependent treatment of ion mobilities, for a geometrically asymmetric capacitively coupled oxygen rf discharge [1]. Within a pressure range of $10 - 100$ Pa the simulations predict that changing surface conditions have a significant effect on the surface loss probability and lifetime of metastable oxygen, and consequently electronegativity, as well as the secondary electron emission coefficient. These substantially influence the plasma sheath dynamics on a nanosecond timescale. For different surface materials, we confirm our findings by comparing excitation features obtained from simulations with phase resolved optical emission spectroscopy measurements. This allows us to develop new metrology concepts to monitor and control plasma-surface interaction processes in real-time. The authors thank Intel Ireland, Ltd. for supporting this research.

[1] A. Greb et al., Phys. Plasmas 20 (2013)

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