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Dynamics of Multiple Ion Species in Low Pressure Capacitively Coupled Argon-Xenon Discharges[1] MAXIMILIAN KLICH, SEBASTIAN WILCZEK, RALF PETER BRINKMANN, Ruhr University Bochum, Bochum, Germany, JESPER JANSSEN, PlasmaMatters B.V., Eindhoven, Netherlands, THOMAS MUSSENBROCK, JAN TRIESCHMANN, Brandenburg University of Technology, Cottbus, Germany — Industrial plasma applications require an accurate control of the ion energy at the substrate surfaces. At the same time, these plasmas contain various gas and ion species, which may imply a complex chemistry. The control of the kinetics of multiple gas and ion species is a topic of current research. We investigate a low pressure argon-xenon discharge by means of Particle-In-Cell/Monte Carlo Collision (PIC/MCC) simulations. The advantage of this noble gas mixture lies in its feasible amount of species and a corresponding simple chemistry. A symmetric capacitively coupled radio-frequency (CCRF) discharge is investigated for a variety of discharge parameters. It is found that a separate control of argon and xenon ions cannot unconditionally be achieved under these conditions. This conclusion is drawn from simulated quantities such as the plasma and ion densities, the fluxes toward the surfaces, the discharge energy balance and, in particular, the ion energy distribution functions (IEDFs) at the electrodes. With the obtained knowledge, it is possible to obtain insight into the formation of complex structures in the IEDFs in plasmas with multiple ion species (e.g., influence of charge transfer collisions).

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