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Control of Ion and Electron Distribution Functions by the Electrical Asymmetry Effect UWE CZARNETZKI, Ruhr-University Bochum, Faculty for Physics and Astronomy — In capacitively coupled RF discharges the ion energy distribution functions at the electrodes and the electron energy distribution function in the bulk can be controlled by the electrically asymmetry effect (EAE). A fundamental RF frequency and its second harmonic are applied in parallel with a fixed but controllable phase. Even in a geometrically symmetric discharge a DC bias is established which can be tuned from negative to positive with the phase as the control parameter. Accordingly the ion energy distribution functions at both electrodes can be controlled. This allows maximizing the ion energy at one electrode while at the same time minimizing it at the counter electrode or vice versa. Also the sheath dynamics and the spatial and temporal Ohmic and stochastic heating of electrons are strongly influenced by the phase. However, the volume and period average of the power input is effectively constant which leads to a similar constant ion flux. The dynamics of these processes has been investigated by experiment, model, and simulation and very good agreement is found throughout. Based on these results the fundamental principles of distribution function control via the EAE will be explained. Further, advantages and limits will be discussed.

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