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Electrical asymmetry effect for controlling the transport of micrometer-sized particles in capacitively coupled plasmas SHINYA IWASHITA, EDMUND SCHUENGEL, JULIAN SCHULZE, Ruhr University Bochum, GIICHIRO UCHIDA, KAZUNORI KOGA, Kyushu University, PETER HARTMANN, Wigner Research Centre for Physics, Hungarian Academy of Sciences, MASAHARU SHIRATANI, Kyushu University, ZOLTAN DONKO, Wigner Research Centre for Physics, Hungarian Academy of Sciences, UWE CZARNETZKI, Ruhr University Bochum — We have developed a novel method to control the dust particle transport in capacitively coupled plasmas via the electrical asymmetry effect (EAE) [1]. At low pressures the EAE allows controlling the spatial potential profile and the ion density distribution by adjusting the phase angle between a fundamental frequency and its second harmonic, resulting in control of forces exerted on dust particles such as electrostatic and ion drag forces. We report the experimental results of this method using SiO_2 particles of 1.5 μm in size, which are inserted into an argon discharge. Initially dust particles tend to be confined at the sheath edge near the bottom electrode, and the change of their equilibrium position with plasma due to the adiabatic phase shift can be well understood by the electric field profile obtained from a simple analytical model. By applying the abrupt change of phase angle from 90 $^\circ$ to 0 $^\circ$ dust particles are transported between both sheaths through the plasma bulk [1]. Based on the model of this transport [1] the potential profile can be obtained by experimental results.

[1] Iwashita S et al., Plasma Sources Sci. Technol. **21** (2012) 032001.

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