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Investigation of ion energy and angular distributions at the wafer edge in rf capacitively coupled reactors using CFD-ACE+ ANANTH BHOJ, ABHRA ROY, KUNAL JAIN, ZHONGMIN XIONG, ESI Group — Dual frequency capacitively coupled reactors are now commonly used in microelectronics fabrication. The extent of possible independent control of ion fluxes and ion energy and angular distribution (IEADs) by varying HF and LF signals is currently a topic of great interest [1]. In this study, we report on investigations of IEADs in single and dual frequency CCPs, including the wafer edge refinement using CFD-ACE+. The current algorithms in CFD-ACE+ allow the determination of total power at the electrode or in the discharge. To account for the presence of two or more rf sources connected to a powered electrode, the existing numerical algorithms for power targeting were enhanced to track current at the electrode as a function of time, vary voltage and determine power as a function of frequency. The Monte Carlo transport module for heavy species in CFD-ACE+ was recently enhanced to compute IEADs in rf discharges. Results for the effect of varying power and pressure on IEADs were compared to semi-analytical models and data reported in Gahan et al [1]. The validated model was applied to investigate the effect of details of HF and LF signals on IEADs in Argon discharges.

[1] Y. Zhang et al, J. Vac. Sci. Technol., A33, 031302, 2015
[2] D. Gahan, et al, Plasma Sources Sci. Technol., 21, 024004, 2012

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