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Simulations of energy and angular distributions in plasma processing reactors using CFD-ACE+ ANANTH BHOJ, KUNAL JAIN, MUSTAFA MEGAHED, ESI US R&D Inc — Several plasma processing reactors employ energetic ion bombardment at the substrate to enable surface reactions such as plasma etching, deposition or sputtering. The knowledge and control of the energy and angular distributions is an important requirement and can be used to suppress or enhance reaction rates. The CFD-ACE+ platform is used for reactor scale modeling of generic inductively coupled and capacitively coupled rf plasma reactors. CFD-ACE+ has a coupled solver approach that includes modules to address in a sequential and iterative manner, fluid flow, heat transfer, the Poisson equation for electric fields, charged species transport equations for species fluxes, surface charge on dielectrics and chemical kinetics in the gas and on all plasma-bounding surfaces. The Monte Carlo transport module of CFD-ACE+ is based on the work of Kushner and co-workers[1] and tracks pseudo-particles representing actual species based on source functions in the reactor. Model outputs for visualization include species densities and energy and angular distribution functions. Results discussed will include the effect of process variables such as pressure, power and frequency on the energy and angular distributions.

[1]R. J. Hoekstra and M.J. Kushner, Journal of Applied Physics, 79, 2275 (1996)

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