Abstract Submitted
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Simulation of the electric potential and plasma generation coupling in magnetron sputtering discharges[1] JAN TRIESCHMANN, DENNIS KRUEGER, FREDERIK SCHMIDT, RALF PETER BRINKMANN, THOMAS MUSSENBROCK, Institute of Theoretical Electrical Engineering, Ruhr University Bochum, Germany — Magnetron sputtering typically operated at low pressures below 1 Pa is a widely applied deposition technique. For both, high power impulse magnetron sputtering (HiPIMS) as well as direct current magnetron sputtering (dcMS) the phenomenon of rotating ionization zones (also referred to as spokes) has been observed. A distinct spatial profile of the electric potential has been associated with the latter [1,2], giving rise to low, mid, and high energy groups of ions observed at the substrate [2]. The adherent question of which mechanism drives this process is still not fully understood. This query is approached using Monte Carlo simulations of the heavy particle (i.e., ions and neutrals) transport consistently coupled to a prespecified electron density profile via the intrinsic electric field. The coupling between the plasma generation and the electric potential, which establishes correspondingly, is investigated. While the system is observed to strive towards quasi-neutrality, distinct mechanisms governing the shape of the electric potential profile are identified.
[1] A. Anders et al., Appl. Phys. Lett. 103, 144103 (2013)
[2] C. Maszl et al., J. Phys. D: Appl. Phys. 47, 224002 (2014)

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