

Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Comparison of lumped element model and particle in cell simulation for radio frequency magnetron discharges¹ DENNIS ENGEL, MORITZ OBERBERG, BIRK BERGER, CHRISTIAN WOELFEL, JAN LUNZE, PETER AWAKOWICZ, JULIAN SCHULZE, DENIS EREMIN, RALF PETER BRINKMANN, Ruhr University Bochum — Radio frequency magnetron sputtering allows to deposit high quality thin films. To gain basic knowledge of the plasma processes this work applies the energy-conserving 2d3v PIC/MCC code ECOPIC2S-M in rz-geometry. Parameters like the energy distribution functions, temperatures, densities and potentials can be obtained. It can be seen, that the discharge can be divided in discrete zones, the bulk, the magnetized region and the sheath regions, which can be linked via Kirchhoff relations. One insight is that the plasma can be approximated by a lumped element model. Compared to the PIC simulation the lumped element description is much faster. Nevertheless, it can be used to gain a fundamental understanding of the discharge. It was successfully used to identify the origin of the Magnetic Asymmetry Effect [1]. The length of the different zones, the current voltage behavior and the electron dynamics at the electrodes can be extracted from the PIC simulation. Those information can be used for the lumped element model. The results of the model are verified against the results of the PIC simulations.

[1] M Oberberg et al., Plasma Sources Sci. Technol. 28 115021 (2019)

¹Funding by the DFG via the project: "Plasmabasierte Prozessführung von reaktiven Sputterprozessen" (No. 417888799) is gratefully acknowledged.

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Date submitted: 07 Jun 2020

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