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Simulation of a PIII reactor with a magnetized remote source MATHIEU MAURY, KHALED HASSOUNI, ARMELLE MICHAU, LIMHP-CNRS (UPR1311) — Plasma Immersion Ion Implantation (PIII) is about to reach the industrial phase, but fine tuning of PIII reactors is still difficult without a correct understanding of the phenomena involved. This is critical in the case of a magnetized cylindrical ICP remote source connected to a large implantation chamber, because plasma coupling mechanisms scale differently in each part of the reactor. A modular simulation has been developed to simulate such a device. First a non-local magnetized electron kinetics model, coupled to a chemical kinetics module treating the relevant reactions for BF3, allows to assess the electron-impact fragmentation of the doping precursor. Then the diffusion of the magnetically expanding plasma from the source to the main chamber is treated with a double layer model. Finally, a Particle In Cell model including all the fragments previously determined is used to determine the sheath dynamics and ion energy distribution on the wafer. The completed model have been fully tested with parametric studies. The plasma chemical composition and ion energy distribution can be readily obtained from the reactor tuning parameters accessible to the operators. The disruption of the source plasma by the implantation pulses and corresponding recovery time have been correlated to the pulse parameters.

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