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Contribution ID: **286** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) P3I code: A new code for Plasma Immersion Ion Implantation modelling

Tuesday 8 June 2021 14:30 (15 minutes)

: Plasma Immersion Ion Implantation (PIII) is a versatile material processing technique [1,2] with many applications in semiconductor doping, micro- and nanofabrication [3], as well as the surface modification of metals for improved resistance against wear and corrosion. In PIII a solid target is immersed in plasma, and negative polarity high-voltage (typically 1-20 kV) are applied the target. During the PIII pulse electrons are expelled, resulting in a positive ion sheath surrounding the target; ions in sheath implanted on solid surface. PIII provides uniform ion implantation with high ion fluences across broad area targets. The targets need not be planar as the plasma is conformal to the immersed target. For precision PIII processing it is important to accurately predict the implanted ion concentrations. The P2I code was developed by Bradley, Steenkamp, and Risch [4,5] to accurately predict PIII sheath dynamic, ion implantation currents and total delivered ion fluence. The P2I code is an efficient implementation of the numerical solution of Lieberman's dynamic sheath model [2]. However, experiments typically show an increase in plasma density during high voltage PIII pulses due to various effects including secondary electrons ejected from the target. The increase in plasma density significantly effects the ion implantation current as well as the implanted ion concentrations.
To address these deficiencies, a new code (P3I) as an advanced version of the existing P2I code which address these discrepancies in measurement by accounting for plasma density enhancement effects. In addition, due to the growing interest in the use of PIII to study ion bombardment of plasma-facing components for fusion applications, the P3I code will incorporate aspects of the Stangeby and McCracken Scrape-off layer (SOL) model [6]. This talk will discuss the development of this new code for various PIII applications.

References

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