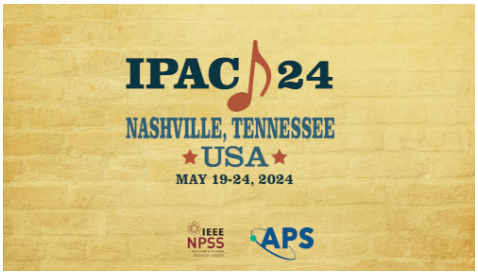

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Particle-in-cell modeling of low-temperature plasma ion sources for ion implantation

Monday, 20 May 2024 16:00 (2 hours)

Numerical modeling of low-temperature plasma (LTP) ion sources provides cost-effective techniques for developing and optimizing beam characteristics for ion implantation and other applications, including plasma processing and etching. Particle-in-cell (PIC) models are a powerful tool for simulating plasma formation and dynamics in LTP sources. Beam formation and transport of the beam through extraction optics can benefit from reduced physical models. One can couple a PIC model for plasma chambers with a different transport model in the extraction region. However, this coupling is ad hoc, and it is often not clear that the models are physically consistent with each other.
We present an integrated modeling capability that couples plasma chamber modeling with beam formation using the VSim computational framework. We leverage advanced modeling techniques such as energy-conserving PIC and variable meshing to improve simulation performance. We present results for modeling and optimization of beams for ion implantation. Our results show that our integrated models can improve optimization of beam currents, beam uniformity, and emittance for LTP ion sources.

Footnotes

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