

Abstract Submitted
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Development and characterization of a fast neutral beam source for damage-free etching¹ MARK BOWDEN, University of Liverpool, DANIL MARINOV, ADETOKUNBO AYILARAN, NICHOLAS BRAITHWAITE, The Open University, ZIAD EL OTELL, IMEC — Etching with energetic neutral beams is a promising technology for next generation sub-10 nm device fabrication. In this study a fast neutral beam has been produced by accelerating, extracting and neutralizing positive and negative ions from different phases of a pulsed discharge. A cylindrical, inductively coupled plasma (ICP) was excited between two planar disk-electrodes in mixtures of SF₆ and O₂ at about 20 mTorr. The discharge was pulsed at 2 kHz and 50% duty cycle. The extraction electrode was a 10 mm thick carbon plate (or a 0.8 mm steel plate) with an array of 1 mm holes, held at ground potential. Ions grazing the sides of the extraction holes incidence have a high probability (70-95%) of neutralization. The other electrode was pulse-biased to extract negative or positive ions during the afterglow phase, after an ion-ion plasma had formed. The total flux and velocity distribution of extracted ions was measured using a retarding field analyser. Extraction of mono-energetic positive and negative ion beams with energies in the range 10 – 300 eV was demonstrated. It was shown that the beam energy can be precisely controlled by the bias waveform tailoring and by positioning of the extraction electrodes.

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