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Manipulation of the bombarding ion energy distribution in fluorocarbon plasma etching AMY WENDT, FRANK BUZZI, YUK-HONG TING, University of Wisconsin - Madison — Ion bombardment is a key element of plasma etching for microelectronics fabrication and other materials processing applications. A sinusoidal voltage waveform typically produces a broad "bimodal" ion energy distribution (IED) at the substrate, with two ion flux maxima, at respective energies considerably above and below the average. In order to deconvolve the effect of ions of multiple energies bombarding the substrate simultaneously, we have manipulated the waveform of the bias voltage to produce two ion flux maxima. By systematically tailoring the shape of the waveform, the energies and relative fluxes of the two IED peaks are varied independently over a 100 to 500 eV range in a fluorocarbon-based helicon plasma, while silicon dioxide and photoresist etch rates are monitored. Two experiments were conducted in which a 100 eV IED peak was combined with a higher energy peak, while the energy and relative flux of the high energy peak were respectively varied. In both cases, a relatively small contribution of high energy ions leads to etch rate enhancement higher than predicted by a linear combination of single peak etch rates at the two energies. We speculate that high energy ion bombardment suppresses fluorocarbon deposition, enabling lower energy ions to more effectively contribute to etching reactions.

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