

Abstract Submitted
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Automated method for creating arbitrary substrate voltage wave forms for manipulating energy distribution of bombarding ions during plasma processing¹ AMY WENDT, UW Madison, MARLANN PATTERSON, UW Platteville, HSUAN-YIH CHU, UW Madison — Accurate and reproducible control of ion bombardment energy during plasma processing is a means to better understand the nature of plasma-surface interaction and to control process outcomes. Ion energy distribution (IED) control can be achieved by tailoring the wave form shape of an rf bias applied to the substrate during processing, through the use of a programmable wave form generator in combination with a power amplifier. Due to the frequency dependence of the amplifier gain and the impedance of the plasma in contact with the substrate, however, it is not practical to predict the shape of wave form needed at the generator to produce a desired result at the substrate. Introduced here is a systematic approach using feedback control in the frequency domain to produce arbitrary wave form shapes at the substrate. Specifically, a fast Fourier Transform (FFT) of the substrate wave form is compared, one frequency at a time, with the FFT of a desired target wave form, to determine adjustments needed at the generator. This iterative procedure, which is fully automated and tested for several target wave form shapes, is repeated until the substrate wave form converges to the targeted shape, providing a quick systematic method for producing an arbitrary IED at the substrate.

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