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Electron and Ion Energy Distributions in Dual Frequency Capacitively Coupled Plasmas Considering Wave Effects[1] YANG YANG, MARK J. KUSHNER, Iowa State University — Dual frequency, capacitively coupled plasma (DF-CCP) tools typically use a high frequency (tens to hundreds of MHz) to sustain the plasma and a low frequency (a few to 10 MHz) for ion acceleration onto the wafers. Achieving uniform, selective and anisotropic etching depends on one's ability to tailor electron energy distributions (EEDs) in the plasma and ion energy and angular distributions (IEADs) incident on wafers. With an increase in both the high frequency and the wafer size, electromagnetic wave effects must be considered that may produce radial variations in electron heating, effecting the spatial variations in EEDs; and in sheath voltages, that could effect the radial distribution of IEADs. To address these spatial variations, a generalized full Maxwell equation solver has been implemented in a 2-dimensional plasma hydrodynamics model. Using a variation of the Finite-Difference Time-Domain method, multiple frequencies can be resolved. Results will be discussed for the spatial dependence of IEADs and EEDs in DF-CCPs for low frequencies of $\leq$10 MHz and high frequencies up to 200 MHz; and gas pressure of $<$ 10s mTorr in electropositive and electronegative gas mixtures.

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