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Computational Investigation of Pulsed Inductively Coupled Plasmas for STI Etching WEI TIAN[1], JC WANG, S RAUF, S SADIGHI, J KENNEY, Applied Materials Inc — As critical dimensions continue to shrink, etching of high aspect ratio Si structures, such as those used for shallow trench isolation (STI), is becoming challenging. Pulsed plasma processing has gained a lot of attention due to its advantages, such as better control of flux and energy, over continuous wave (CW) plasmas processing. Pulsed plasma provides us with extra knobs to tailor the etching process. In this talk, an inductively coupled plasma (ICP) at a few mTorr with pulsed source (W_s) and RF bias (W_b) has been computationally studied for STI etching. Three pulsing schemes are investigated: source pulsing (pulsed source W_s + CW bias W_b), bias pulsing (pulsed bias W_b + CW source W_s), and their synchronized pulsing. It is found that when the source power is pulsed (pulsed W_s + CW W_b), plasma extinguishes during the pulse-off period, higher sheath voltage up to a few kV is produced as a result of lower electron density. When the bias power is pulsed (pulsed W_b + CW W_s), plasma density is slightly modulated by the bias power, while sheath voltage increases up to the kV level during the pulse-on period. When the source and bias powers are synchronized, the ion angular and energy distribution function (IAEDF) is sensitive to the phase between powers.

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