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Charge neutralization in electronegative rf power pulsed plasmas¹

ALEX PRESS, KEITH HERNANDEZ, MATTHEW GOECKNER, LAWRENCE OVERZET, The University of Texas at Dallas — It has been noted that in electronegative plasmas, rf power pulsing can allow for etch feature charge neutralization. The main mechanism is thought to be formation of an ion-ion plasma which allows negative ions to reach the bottom of the features being etched and neutralize positive charge build up. However, charge neutralization is observed when rf power pulse frequency is too high for a fully ion-ion plasma to form and negative ions to reach the surface. In these cases, although a fully ion-ion plasma may not form, the electron population will be decreased at the end of the rf power off time, and positive current will have time to reduce the total charge on the surface. When power is reapplied, its positive magnitude may be great enough to cause the sheath to invert for a short time, causing an anisotropic distribution to interact with the surface reaching the bottom of etch features. Another explanation is the total surface charge has been reduced to a point where the local feature charges dominate enough space around them that they "capture" a large enough portion of the electrons reaching the surface when power is applied to cause some charge neutralization. In this presentation, current and voltage results pointing to this sort of charge neutralization will be presented.

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