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Origin of electrical changes at plasma etching endpoints MARK SOBOLEWSKI, DAVID LAHR, National Institute of Standards and Technology — Electrical signals are often used for endpoint detection in plasma etching, but the origins of the electrical changes observed at endpoint are not well understood. Such changes may indicate a difference in plasma electron density caused by changes in the gas-phase densities of etch products and reactants. Alternatively, changes in substrate electrical properties or surface properties (such as work function or secondary electron yields) may be involved. Investigation of these effects was carried out in an inductively coupled reactor equipped with rf bias and a wave cutoff probe, which allows small changes in plasma electron density to be measured with good accuracy and resolution. Simultaneous cutoff probe and electrical measurements were made during CF_4/Ar etches of SiO_2 films on Si substrates. Changes observed in the voltage, current, impedance and phase components at the rf bias frequency were related to, and fully explained by, changes in electron density. The dc self-bias voltage and harmonic signals showed more complicated behavior. The results allow several conclusions to be drawn about the relative reliability of endpoints obtained from different electrical signals.

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