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In-situ Endpoint Detection for Dielectric Films Plasma Etching Using Plasma Impedance Monitoring and Self-plasma Optical Emission Spectroscopy with Modified Principal Component Analysis

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Endpoint detection with plasma impedance monitoring and self-plasma optical emission spectroscopy is demonstrated for dielectric layers etching processes. For in-situ detecting endpoint, optical-emission spectroscopy (OES) is used for in-situ endpoint detection for plasma etching. However, the sensitivity of OES is decreased if polymer is deposited on viewport or the proportion of exposed area on the wafer is too small. To overcome these problems, the endpoint was determined by impedance signal variation from I-V monitoring (VI probe) and self-plasma optical emission spectroscopy. In addition, modified principal component analysis was applied to enhance sensitivity for small area etching. As a result, the sensitivity of this method is increased about twice better than that of OES. From plasma impedance monitoring and self-plasma optical emission spectroscopy, properties of plasma and chamber are analyzed, and real-time endpoint detection is achieved.

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