【P-12】

In-situ Plasma Diagnosis with an Optical Emission Spectroscopy during BCl_3-based High-Density Inductively Coupled Dry Etching

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Plasma diagnosis with Optical Emission Spectroscopy is important for precise control of dry etching process. Especially Optical Emission Spectroscopy can be a very useful tool for monitoring of dry etching of compound semiconductors. OES technology does not interfere plasma processing during monitoring. It helps easily diagnose the plasma intensity and monitor the end-point during high-density plasma etch processing. We examined Ar, N2, BCl3, BCl3/Ar, BCl3/N2 planar inductively coupled plasma with an optical emission spectroscopy as a function of ICP source power, RIE chuck power, chamber pressure and gas flow. The scan range of wavelength was 400 - 1000 nm. It was found that changes of ICP source power and chamber pressure varied peak intensity of BCl3/Ar plasmas, while those of RIE chuck power and flow rate played a little role to change the peak intensity of the plasmas. Meanwhile, Increase of ICP power and chamber pressure reduced negatively induced self dc bias on the chuck. We believe that high dissociation of plasma species in the ICP reactor increased plasma intensity and ion flux, which resulted in reduction of the negative dc bias on the chuck. We will also present utilization of an OES peak (especially, Ga peak) in order to have an end-point detection signal during etching of large wafer GaAs/AlGaAs and GaAs/InGaP selective and non-selective etching.