
Challenges to the next generation semiconductor equipment by using plasma

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Various kinds of plasma equipment are widely used for semiconductor manufacturing processes including etch, deposition, clean, etc. A lot of problems such as uniformity, selectivity, tilting, and defect related with process performance are well known to us. However, recently those kinds of performance related issues as well as productivity and diagnostic issues become more critical. As the aspect ratio of the pattern increase, RF power increase sharply, then it requires more electric energy and heat exchanger capacity for which larger chiller is needed. To perform atomic layer deposition and etching process without interference of previous step gas, larger purge and pumping units are necessary. Therefore huge size of vacuum pump and piping capacity are required too. For diagnostics of plasma tool, optical emission spectroscopy is generally used to detect the intensity and spectroscopic behavior of it. However, these are not enough to guarantee whether the process is right. More precise and quantitative information about plasma is needed. Also there is not sufficient method to detect particles which are produced during process. We always pursue energy and space efficient equipments and more precise diagnostic methods.