Deposition of SiO_2 Layer in a 300mm Rapid Thermal Process Equipment using Remote Oxygen Plasma

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Recently thermal processes of silicon wafer for manufacturing ultra shallow junction device narrower than 90nm are progressed continuously with thermal budget decreasing trend. In the deposition method, rapid thermal process or low pressure chemical vapor deposition is mainly used. But these techiques still have many problems such as ultra thin gate dielectric trouble and large gate leakage currents. Moreover equivalent oxide thickness of gate dielectric must be maintained less than 1.2nm but for this large heat sources are needed in thermal process.
In this research, 3-D simulation study has been conducted using a commercial CFD software called CFD/ACE-TOPO on SiO_2 deposition in a 300mm remote plasma rapid thermal process (RP-RTP). Using the simulator, effects of gas flow rate, pressure, temperature, and location and shape of the injection port on the rate and uniformity of SiO_2 deposition have been investigated. The RP-RTP equipment is being under development by a company as a low thermal budget thermal deposition commercial equipment and the simulation results are used to improve the design and operating conditions.