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High speed deposition of SiO_2 film by slot-type microwave CVD system[1] HIROTAKA TOYODA, MASAKI YAMAMOTO, HARUKA SUZUKI, Nagoya University — High density microwave plasma is attractive because of its ability for high-throughput processing. So far, we have successfully produced large-area surface wave excited plasma (SWP) and have applied it to plasma-enhanced chemical vapor deposition (PE-CVD) of silicon films. However, the SWP requires a dielectric plate for the surface wave propagation, and high density plasma sometimes erodes the dielectric plate to produce oxygen contamination. To avoid such problem, we propose the PE-CVD using the microwave plasma produced inside slots of a waveguide without using the dielectric plate. A 2.45 GHz pulsed microwave (repetition: 20 kHz, duty ratio: 20%, average power: 40 W) is introduced to a rectangular waveguide through an isolator, a tuner, and a vacuum window. A slot of 4 mm in length and 0.2 mm in width is placed at the end of the waveguide, and is connected to a vacuum chamber. Both the waveguide and the chamber are evacuated by a turbomolecular pump. Oxygen and tetraethyl orthosilicate (TEOS) gases are introduced from the waveguide and from the outside of the waveguide, respectively, to deposit SiO_2 film on Si substrates at a pressure of 15 Torr and a slot-substrate distance of 1.1 cm. Deposition rate as high as 80 nm/s is observed at a TEOS flow rate of 0.8 sccm. The result suggests that the present PE-CVD system is promising as a new high-speed film deposition technique.

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