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Concept of Dynamic Control of Magnetic Field for High-Throughput and Wide-Area Etching by Neutral Loop Discharge Plasma[1]
HIROTAKE SUGAWARA, Hokkaido University — Neutral loop discharge (NLD) plasma is a magnetically enhanced high-density low-pressure inductively coupled plasma for dry etching. It is generated along a magnetically neutral loop (NL) at which the magnetic fields induced by three coaxial coils surrounding the plasma chamber cancel each other.[2] A Monte Carlo analysis of electron transport in an NLD plasma revealed that electrons obtain energy near the NL and diffuse towards the wafer along a separatrix of the quadrupole magnetic field.[3] This result indicates that etchant species are produced around the separatrix and that the etching rate is high around the position at which the separatrix crosses the wafer. To obtain flat etching rate profile over the wafer and high etching throughput by the NLD plasma, concept of a round arrangement of wafers and a control technique to let the separatrix sweep over the wafers is proposed.

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[2]T. Uchida and S. Hamaguchi: *J. Phys. D: Appl. Phys.* **41** (2008) 083001.
[3]H. Sugawara, T. Osaga, H. Tsuboi, K. Kuwahara and S. Ogata: *Japan. J. Appl. Phys.* (accepted for publication).

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