Production and Control of Reactive Plasmas for Processing of Advanced Materials

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Objective
Developing novel techniques for production and control of physically and chemically reactive plasmas, and applying the advanced plasma process to fabrication of nano-structured materials and Nitride semiconductors.

Project Outline
Plasma process is widely used in industry for micro-fabrication, thin film coating and surface modification. This project is aimed at developing novel techniques for plasma production and for precise control of chemical and physical reaction processes in plasmas. For the development of these novel techniques, time modulation and pulse operation of electrical power, gas supply and vacuum exhausting, micro-gas jet, micro-gas discharge and micro-plasma, and nano-structure electrodes will be the subjects of experimentation. In this project, the successful candidate would be expected to design and to construct a novel plasma reactor on the basis of physics, chemistry, electromagnetics, electronics and electrical engineering, and to examine the performance of prototype experimental devices. The successful candidate for this project will have basic knowledge of the principles of gas discharge and plasma science, vacuum system and engineering, and some experience in plasma production and diagnosis.
The plasma reactor developed here will be applied to the micro/nano-fabrication of advanced materials and to the growth of Nitride semiconductors. The resulting material will be investigated by using SEM, TEM, EDS, XRD, Raman, FT-IR, XPS, etc. by the candidate in collaboration with other members of the laboratory. The successful candidate will have sound basic knowledge of material science and the skills to operate material analyzers.

References
"Formation of Nanofibers on the Surface of Diamond-Like Carbon Films by RF Oxygen Plasma Etching", Tooru Harigai, et al., Jpn. J. Appl. Phys. 50 (2011) 08JF12.
"Local sputter etching by micro plasma jet in SEM", Khanit Matra, et al., Vacuum (in press).

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