25th Anniversary

IEEE CONFERENCE RECORD — ABSTRACTS

1998 IEEE International Conference on Plasma Science

North Raleigh Hilton
Raleigh, North Carolina
June 1–4, 1998

Sponsored by
Plasma Science and Applications Committee
of the
IEEE Nuclear and Plasma Sciences Society

Tuesday Afternoon – June 2, 1998
3:00PM – Ballroom 1,2,3

Poster Session 4P36-62
5.1 Non-equilibrium Plasma Processing

4P36

A Novel Distributed Control System for Plasma Immersion Ion Implantation Control and Automation

A. G. Liu, X. F. Wang, B. Y. Tang, P. K. Chu
Department of Physics and Material Science
City University of Hong Kong
Kowloon, Hong Kong

P. K. Ko
School of Engineering
Hong Kong University of Science and Technology
Clear Water Bay, Kowloon, Hong Kong

Y. C. Cheng
Hong Kong University, Pokfulam Road, Hong Kong

The high voltage and electromagnetic field environment poses a big challenge to a control system for plasma immersion ion implantation (PIII). The automation process must be immune to electric field interference produced by the high voltage pulse power supply, radio frequency plasma generator, MEVVA plasma sources, and so on. We have recently designed and installed a distributed control system, PIIIDCS, for PIII facility. Programmable logic controllers (PLC) are used as the field control stations because of their good anti-interference ability and good real time response. A DH-485 network is used as the communication link between the field controllers and the management station in order to improve the robustness and reliablility of the system. The newly developed interface is designed to work in a graphic mode in Microsoft Windows 95. Test runs have shown that the system is reliable, flexible, and easy to operate. The development of this novel control system will expedite the development of commercial PIII instrumentation.

4P37

Measurement of Time-Dependent Sheath for the Planar Target in Plasma Source Ion Implantation

G.-W. Kim, S.-H. Han[1], G.-H. Kim
Research Center for
Electronic Materials and Components
Hanyang University-Ansan, Ansan, Korea
[1]Advanced Analysis Center
Korea Institute of Science and Technology
Seoul, Korea

In plasma source ion implantaion (PSII), the target is biased by sucessive negative voltage pulses with an intrinsic finite rise time to implant ions from plasma to target surface, resuling in a time-dependent sheath around target. In this work, the Langmuir probe was used to study the sheath motion around a planar target with various pulse conditions and plasma conditions in PSII. It was observed that the time-dependent sheath consisted of two parts: the ion matrix sheath development and the dynamic sheath motion. A new model for the ion matrix sheath development was proposed to explain the experimental results which were decrepant in the Lieberman's model [1] and the computer simulation. The ion matrix sheath development was in proportion to square root of pulse rise rate over plasma density and also to square root of pulse rise time. The dynamic sheaths were faster than the ion acoustic speed after the pulse rise and eventually slowed down to approximately a third of ion acoustic speed.

[1] R.A. Stewart and M. A. Lieberman, J. Appl. Phys. 70(7), 3481 (1991).