5th Asia-Pacific Conference on Plasma Science & Technology
13th Symposium on Plasma Science for Materials

BOOK OF ABSTRACTS

September 10-13, 2000

Dalian, CHINA

Surface Modification Using Pulsed High-Voltage Glow Discharge

X. B. Tian and Paul K. Chu

Department of Physics and Materials Science, City University of Hong Kong, 83 Tat Chee Avenue, Kowloon, Hong Kong, China
E-mail address: paul.chu@cityu.edu.hk

It has been shown in our previous work that it is possible to sustain a low-pressure glow discharge in a pulsed high-voltage mode and ion implantation can consequently be conducted. The ions are produced by the pulsed high-voltage glow discharge process and accelerated into the exposed sample surface biased at a high voltage (tens of kV). One big advantage of this technique is that components with a complex geometry can be treated without target manipulation as needed by beam-line ion implantation. In addition, unlike conventional plasma immersion ion implantation (PIII), external plasma sources e.g. hot filament glow discharge, ECR, RF plasma sources, are unnecessary. The mechanism of this novel process is likely different from that of PIII and plasma nitriding in terms the nitrogen transportation, sputtering, and reaction dynamics. In this paper, we will describe our pulsed high-voltage glow discharge experiments performed at low temperature, and discuss the results of implanting nitrogen into silicon wafers. The retained dose and implantation depth are measured by Auger electron spectroscopy (AES). The dose uniformity along the radial direction on a round copper platen is also measured. The results are compared to those of conventional PIII using an external hot filament glow discharge plasma source. For more relevant comparison, the average input current is kept constant although the practical current configuration is considerably different. The same experimental parameters are also used in the two processes: 25kV implantation voltage, 20 μs pulse duration, 150Hz pulsing frequency, and a total treatment time of 60 min.

Presentation author: **X. B. Tian**