

플라즈마발생기의 이온분율 측정 장치 설계 및 제작

이찬영

한국원자력연구원

The design and fabrication for ion fraction measurement of plasma generator

Chan-Young Lee

Korea Atomic Energy Research Institute

Abstract : Ion implantation has been widely developed during the past decades to become a standard industrial tool. To comply with the growing needs in ion implantation, innovative technology for the control of ion beam parameters is required. Beam current, beam profile, ion fractions are of great interest when uniformity of the implant is an issue. Especially, it is important to measure the spatial distribution of beam power and also the energy distribution of accelerated ions. This energy distribution is influenced by the proportion of mass for ion in the plasma generator(ion source) and by charge exchange and dissociation within the accelerator structure and also by possible collective effects in the neutralizer which may affect the energy and divergence of ions. Hydrogen atom has been the object of a good study to investigate the energy distribution. Hydrogen ion sources typically produce multi-momentum beams consisting of atomic ion (H^+) and molecular ion (H_2^+ and H_3^+). In the beam injector, the molecular ions pass through a charge-exchanges gas cell and break up into atomic with one-half (from H_2^+) or one-third (from H_3^+) according to their accelerated energy. Burrell et al. have observed the Doppler shifted lines from incident H^+ , H_2^+ , and H_3^+ using a Doppler shift spectroscopy. Several authors have measured the proportion of mass for hydrogen ion and deuterium using an ion source equipped with a magnetic dipole filter.

We developed an ion implanter with 50-KeV and 20-mA ion source and 100-keV accelerator tube, aiming at commercial uses. In order to measure the proportion of mass for ions, we designed a filter system which can be used to measure the ion fraction in any type of ion source. The hydrogen and helium ion species compositions are used a filter system with the two magnets configurations.

Key Words : Ion source, Larmor radius, permanent magnet dipole filter system

참고 문헌

- [1] C. F. Burrell, W. S. Cooper, R. R. Smith, and W. F. Steele, Rev. Sci. Instrum. 51, 1451 (1980).
- [2] K. W. Ehlers and K. N. Leung, Rev. Sci. Instrum. 52, 1453 (1981).
- [3] K. W. Ehlers and K. N. Leung, Rev. Sci. Instrum. 53, 1423 (1982).
- [4] J. H. Lee, J. W. Park, J. S. Lee, C. W. Sohn, J. K. Kil, Surf. Coat. Technol. 196, 353 (2005).