ENERGY DISTRIBUTION OF NEUTRAL AND CHARGED PARTICLES IN A MAGNETRON DISCHARGE IN HYDROGEN

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ABSTRACT

Particle energies were investigated in a planar magnetron discharge in hydrogen, established in a strong magnetic field. The energy distribution of ions, diffusing through a differentially pumped orifice in the cathode and alternatively in the anode, were examined by magnetic analysis.

The energy spectra of H atoms re-emitted from the electrodes was derived from broadening of spectral lines, H atoms being excited during their passage across the discharge. Intensity distributions within the balmer line wings revealed the presence of three groups of suprathermal H atoms, those originating from neutralization of protons and H_2 molecules and of a slower group, at energies below 50 EV, due very likely to sputtering of implanted hydrogen.

A comparison of the energy spectra of positive and negative ions with those of neutrals yields useful information on the interactions of comparatively slow ions and atoms with metal surfaces, under high dose rates. The effects of electrode composition and hydrogen implantation on particle and energy reflection coefficients are considered. Experimental results and theory are compared.