SECONDARY ELECTRON EMISSION IN A DETECTOR OF PLASMA FAST NEUTRALS

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Many presently operating corpuscular diagnostic apparatuses don't work at ultrahigh vacuum condition [1] . The incident neutral flux cannot destroy the equilibrium between the active surface of a detector and background gas molecules. Unfortunately, only a single paper [2] treats systematically secondary emission from "dirty" surfaces.

In this work we present the measured secondary emission coefficients for various light atoms, molecules (γ^0) and ions (γ^+) incident on Cu-target in the energy range 10^2 - 10^4 eV at the conditions, similar to those in plasma experiments. The measurements were performed with an adapted apparatus described previously [3] . Monoenergetic ion beam, extracted from PIG-ion source, was momentum-analyzed and focused into a gas-filled neutralization cell. Fast atoms resulting from charge-exchange collisions struck normally Cu-target of the detector. The apparatus was evacuated by diffusion pumps with "SANTOVAC" as pumping fluid, background preassure in the vicinity of the detector being about $(1-3).10^{-4}$ Pa. Intensity of the neutral beam was calculated from the measured gas density in the neutralization cell and known charge-exchange cross-section. To check a role of scattering in the charge-exchange collisions, the measurements of scattering angle with an iris diaphragm installed between the neutralization cell and the detector was performed. The half angle of the neutralization cell ($\alpha \sim 5,7^0$) was found to be sufficiently high to allow the detection of most neutrals created in the neutralization cell.

Supposing the secondary emission from a gas-covered surface is dominated by binary encounters between the primary atoms and adsorbed molecules, we plot our results of γ^0-measurements as function of excess C.M. energy $E_{CM} - E_i$ (where E_i -ionization potential of the adsorbed molecules). In such a plot the electron production cross-section for different atoms and molecules shows a similar behaviour [2] . For simplicity, H_2O molecules were assumed to be the principal adsorbed species (M = 18, E_i = 12,6 eV). Following Fig. 1 the values of γ^0 for primary H_1^0, H_2^0, He^0, N_1^0, O_1^0 beams are the same within a factor 1,2 - 1,6 at any energy. Moreover, the shapes of the curves agree well with the measurement of γ^0 for $H_1^0 \rightarrow$ CuBe [4] . The γ^0 values for primary

N_2^o and O_2^o exhibit a different behaviour. The slope of the dependence is much higher but agrees with conclusions of [2] . It should be noted that we have any information nor about amount of excited-state molecules, nor about the degree of dissociation in the primary N_2, O_2 beams.

The results of γ^o/γ^+ -ratio measurements are summarised in the following table:

E_{lab}/ keV /	0,2	0,3	0,5	0,7	1	2	3	5	7	10
H_1	———			1,30 ± 0,15						———
H_2	———			1,31 ± 0,06						———
He	0,50	0,68	0,89	1,01	1,18	1,19	1,31	1,29	1,35	1,34
N_1	1,94	1,78	1,58	1,50	1,39	1,12	1,25			
O_1	• ———		1,03 ± 0,08							———
N_2	• ——		2,36 ± 0,38		———					
O_2	——		2,88 ± 0,56		———					

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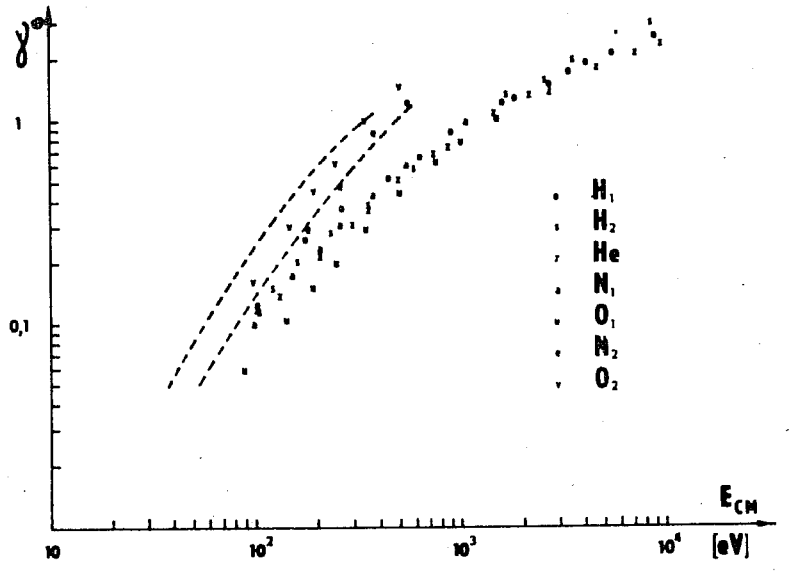

Fig. 1