PARK
IP TRANSLATIONS

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Certification

Park IP Translations

This is to certify that the attached translation is, to the best of my knowledge and belief, a true and accurate translation from Russian into English of the Encyclopedia of Low-Temperature Plasma, Introductory Volume III.

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Project Manager

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ENCYCLOPEDIC SERIES

ENCYCLOPEDIA OF LOW-TEMPERATURE PLASMA

Introductory Volume
III

Under the editorship of
V. E. FORTOV,
Member of the Academy of Sciences

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MAIK "NAUKA/INTERPERIODICA"
2000

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INTERACTION OF LOW-TEMPERATURE PLASMA WITH CONDENSED MATTER, GAS AND ELECTROMAGNETIC FIELD

INTRODUCTION

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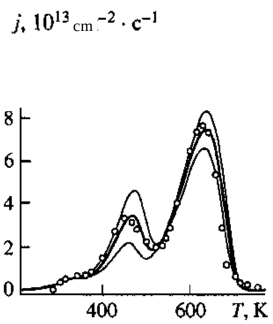
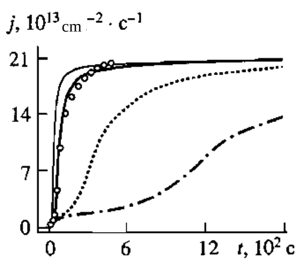
$$S = 4\pi r D[u(w - y) - N\xi y \exp(-E_b/kT)].$$

Here u is concentration of diffusing gas, y – concentration in defects, w – concentration of defects themselves, φ – ion slowing profile, S – drain in defects, r – effective radius of defect, N – SB atomic density, ξ – the number of possible locations in interstitial sites around a defect.

In the case of diffusion in multilayered structure diffusion in each stratum is considered, concentrations at boundary lines are related through solvability. An external source is usually taken from independent calculations. Internal drain in defects consists of two members: diffusion inflow in defects and thermally or radiationally activated outflow out of them. The same member in a diffusion equation also describes the velocity of accumulation of particles in defects-traps. Usually some types of defects with various binding energies and concentrations are considered, but the above given drain fixed for one type of defects. In boundary conditions the balance of diffusion flow and desorption flow is registered. It is supposed that between concentrations on SB surface and beneath it the local balance is set, i.e. if the coefficient of proportionality of these concentrations is taken correctly, desorption velocity is proportional to the quadrate of volume concentration near to a surface. The coefficient of proportionality known as an effective recombination coefficient is either calculated analytically, or measured experimentally. Except the second order desorption in boundary conditions the thermal and radiationally activated desorption as well as desorption of the first order can be entered.

Computer programs allowed to describe considerable quantity of various experiments on the ionic introduction of gas (VI. 1.308 VI. 1.309). An inevitable problem in this case is a considerable quantity of parameters which frequently unknown before the experiment and are viewed as adjustable ones. Therefore,





Pic. VI. 1.308. Thermodesorption spectrum D, introduced under ion bombardment in W at 473 K; points – experiment; lines – calculation at various velocities of defects occurrence during ion implantation

Pic. VI .309. Re-emission of deuterium during ion irradiation; points - experiment, lines - calculation at various values of peak concentration of defects yield at irradiation

for more or less accurate selection of parameters the concurrent description of several experiments is done. In this case arbitrariness of parameters selection is strongly restricted. These parameters, defined from the experiment, are then possible to use for predicting the behavior of ion-implanted gas under other conditions.

To summarize one should note that a considerable quantity of empirical information on implantation of ions in SB is collected by now. In elementary modeling situations the experimental regularities are rather clear and they can often be well described mathematically. However, the physical pattern of phenomenon often appears essentially more complex than beliefs available at present. There are many facts which cannot be explained, and there are a lot of factors which can hardly be predicted. Therefore, practical predictions of behavior of ion implanted gas for specific technical applications need proper attention.

1. McCracken G.M. The Behaviour of Surfaces under Ion Bombardment. Reports on Progress in Physics. 1975. V.38. P.241-327. 2. Ozawa K,, Fukushima K., Ebisawa K. Data Compilation for Radiation Effects on Hydrogen Recycle in Fusion Reactor Materials. Preprint

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