In the paper, influence of both the titanium and the boron dopants on the graphite surface modification under helium ion bombardment have been studied experimentally. Incorporating of 3-5% of titanium in the fine grain graphite was shown to stimulate the ion induced surface stresses, when temperature of the samples was 500°C. The stresses initiated development of cone like structures on the irradiated surface. Analogous quantity of boron did not stimulate the development of remarkable surface stresses under ion bombardment. Accordingly, the surface relief modification was much less, than on the titanium modified graphite.
1. Introduction

Ion and plasma interactions with multi-component surface at the high temperature occur much different than with mono-component surfaces of metals, graphite, etc. The ion bombardment of the multi-component surfaces causes the surface stresses, acceleration of the diffusion, and the dislocation motion, recrystallization. As a result the development of the surface relief, structure and content modifications up to the microscopic depth are developed.

In such conditions the yield of the cascade and chemical sputtering are sufficiently changed, the another sputtering mechanisms could be activated (for instance, ion-stimulated desorption), the intensity and features of the ion retention and gas release could be modified. The character of the above-mentioned transformations depends on the surface temperature and on parameters of the irradiated particle flow. One can conclude that investigation of the main features and parameters of the multi-component material modification is necessary for prediction of their behavior under various conditions.

2. Experiments.

2.1. EXPERIMENTAL CONDITIONS.

The experiments were performed in a gas discharge switched in a three-electrode system similar to that described by Wehner [1]. The residual gas pressure did not exceed $5 \times 10^{-4}$ Pa. The mean free path of the sputtered particles exceeded this value. The electron temperature and plasma density determined by a double Langmuir probe was 10 eV and $10^{10}$ cm$^{-3}$ in the vicinity of the target. The discharge area was surrounded by a jacket with an average dimension of 30 cm under floating potential. Sputtering of the jacket was negligibly small and did not affect conditions on the sample.

Helium ions were directed onto the sample using a negative potential. Experiments have been carried out with fine grain graphites of RG-B type (4%B$_4$C by mass), RUM type (4+20 %B$_4$C by mass), RGT (3.5 at% Ti), one-dimensional graphite fiber material VMN-4+TiC. On the cross section of the carbide doped material of VMN-4 type perpendicular to the graphite fibers, the grains of the titanium or boron carbides were measured near 5 μm and was distributed approximately uniformly. The main distance between neighboring

Fig.1. The irradiated surface of RGT type graphite.