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SURFACE NANOSTRUCTURING OF KTP CRYSTAL BY CLUSTER ION BOMBARDMENT*

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The periodic nanostructures on the surface of various materials can lead to unique anisotropy of properties: optical activity, conductivity, adhesion, wetting, etc. [1, 2]. Previously, it was shown that the ion beam bombardment of the surface at oblique angles of incidence can be used as one of the methods of self-organizing nanostructuring [3, 4]. In the comparison with the monomer ion beam, the nonsize-selected beam of cluster ions has high intensity and cluster impact on a target leads to minimum subsurface damage [5–7].

Earlier, we have experimentally studied the influence of angles of cluster incidence on nanostructure formation on the surface of potassium titanyl phosphate (KTP) single crystals [8]. In this work, the features of surface nanostructuring of KTP surface by argon cluster ions with the different energy per cluster atom, ion fluence have been studied. To study the characteristics of the periodic nanostructures, we used the atomic force microscope (AFM) Ntegra Prima HD. Figure 1 shows the AFM images of KTP surface before and after cluster ion bombardment with the kinetic cluster energy E = 6.5 keV and mean cluster size N_{mean} = 600 atoms at the scan sizes of 2×2 μm^2 with a resolution of 1024×1024 pixels.

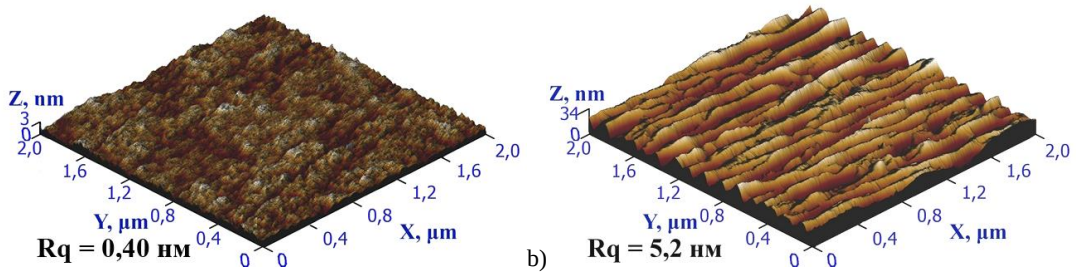

Fig.1. 3D AFM images of the KTP surface: a) as-prepared, b) after the cluster ion bombardment.

The characteristics of self-organizing nanostructures, the etching rates and sputtering yields for KTP single crystals in a wide range of energy per atom in the argon cluster (E/N_{mean} = 10–110 eV/atom) have been determined. A comparison has been made of the nanostructures formed at the same mass fluxes, but at different parameters of cluster ions. The dynamics of changes in the parameters of nanostructures depending on the ion fluence are demonstrated.

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