Нанокомпозити та наноматеріали

Nanodimension layers on stainless steel surface synthesized by ionic implantation and their simulation

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The number technologies used the high energy stream of the matters utilize for the nanoscale materials modification. One of these techniques is the ionic implantation, which has well reputation in microelectronics as a method of the elements nanolayers formation.

It is known that the mechanism of the interaction of implanted ions with based matter is very complex and realized in multistep processes. So, the control and prevision of the prepared materials properties rest by actual problem of this method use. Recently by use of optical and atomic force microscopy it was shown that the properties of the element nanolayer formed on stainless steel depend from process intensity and ions nature.

The Authors of this communication develop computer program «RIO», which permits to calculate the distribution of different elements implanted ions in the depth of various substrate materials, taking into account the diffusion of atoms and their emission from the surface. In this model the atoms sputtering process and the formation of the deposited film considered also.

As results using some approximations the process of the elements ionic implantation on rough surfaces was simulated. The cross section and distribution of the ions implants on the depth after implantation process were obtained. These results permit to calculate such parameters as the surface roughness, profile length, average pitch angle, etc.

For the calculation of the samples specific surface area it is necessary to know the full relief roughness coefficient and the determination of cross section only is insufficient. This problem was solved by means of neural networks using for simulation of the surface of nano-modified materials.

The results obtained by means of SEM, Kr low temperature sorption and optical microscopy methods show the good agreement with the calculated data.