Formation of nanostructures on metals surface using slow highly charged xenon ions

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In recent years, many experiments have been devoted to the study of nanostructures formed as a result of the interaction of highly charged ions (HCl) with solids [1], nanolayers of metals such as titanium and gold [2,3] and two-dimensional materials such as MoS_2 [4] or graphene [5]. Accelerated HCI stores its energy in the form of the kinetic energy and the potential energy, which is related to the charge state of the ion. When HCI collides with a surface, its energy is deposited into the solid, which can lead to permanent surface modifications. The fundamental mechanism of formation of these modifications is still under investigation.

This work presents the recent experimental studies aimed at understanding of mechanism of creation of nanostructures on the surface of metal nanolayers as a result of their irradiation with slow highly charged Xe^{q+} ions. The nanolayers of various metals were prepared by the metal evaporation on silicon Si (100) substrates. The nanolayers were irradiated at the Kielce EBIS facility, under high vacuum conditions. Before and after irradiation the nanolayer surfaces were investigated using the scanning probe microscopy. As the result, well pronounced modifications of the nanolayer surfaces in the form of craters and hillocks were observed. Systematic analysis of the nanostructure sizes (diameter on the surface and depth or height) allowed us to determine the influence of the deposited energies on the size of the obtained nanostructures [3].

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