13th International Conference on Nanosciences & Nanotechnologies (NN16)
5-8 July 2016, Thessaloniki, Greece

The nanoscale structure modification of steel samples after pulse plasma flows treatment

A. Zhukeshov, A. Gabdullina, A. Amrenova, Zh. Moldabekov, G. Shigaeva
Department of physics and technology, al-Farabi Kazakh National University
al-Farabi av. 71, Almaty, Kazakhstan

The results of research of steel samples after pulsed plasma flows treatment are presented. The materials treated by air plasma at different energy density by several time repeated pulses. AFM analysis revealed that the surface of the material in the double treatment traces blisters, the presence of the layered structure and tracks the formation of columnar structures, which may be due to the planar and linear defects. When the same processing as tenfold, more ordered structure, columnar blocks are arranged relatively uniformly over the surface and the tracks are located mainly at grain boundaries. As a result of microhardness analysis can be concluded that repeated treatment (n = 10) of the samples increases surface hardness, and for the second type of steel (AISI 321), the effect is more pronounced than for the other (AISI 201), which is consistent with the results SEM- analysis. All of the above is confirmed by the RSA, by means of which changes have been identified in the structure of the studied steels associated with the formation of a new phase - iron nitride in the lattice that may be responsible for the hardening. Summary, the results of work performed can be concluded that treatment with pulsed plasma flows leads to changes in physical and mechanical properties at the nanoscale, and this may be due to structural and phase changes. Furthermore, the SEM analysis showed that after treatment there is redistribution of nanoscale crystallites. In this case, the role of crystallite size reduction must be large on hardening processes.
.