

PULSED PLASMA ACCELERATOR FOR STEEL SAMPLES SURFACE MODIFICATION

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The pulsed plasma accelerator (PPA) with energy storage capacity 70 uF, 30 kV work voltage is created for obtaining of powerful plasma flows. High power fluxes (up to 60 J/cm², 14 μs duration) generated by PPA, have been used in different applications such as surface modification, hardening and film formation [1-3].

As known, the performance of a PPA strongly depends on the geometry of its electrode system as well as on the mode of its operation. In this work is researched so called "continuously filled" mode, then the working gas fills all space between to coaxial electrodes (diameter 9 and 3 cm, length 50 cm). The mainly plasma parameters are follow: maximum flow velocity 9,6 cm/μs, electron temperature ~ 5 eV, density of plasma ~10¹² cm⁻³.

The researches was shown, that after plasma irradiation with energy 12-18 J/cm², the surface of all types of metals is melted. In the result of high scale recrystallization on subsurface area formed a three component phase mixture. So, the common steel formed as a result of two phases - ferrite and austenite, at low energy density, and iron carbide - after repetition influence. The sizes of new phases crystals, determined by Sharer's method was decrease from 120 to 20 nm. The microhardness of common and instrumental steels after processing by plasma fluxes, improved up to 3-5 times, and the depth of modification area up to 250 μm.

Summary, high intensity pulsed plasma treatment is perspective technology for creating of instrumental materials with given properties.

1. V.V. Chebotarev, I.E. Garkusha, J. Langner M., at al Surface Structure Changes Induced by Pulsed Plasma Streams Processing," Plasma Physics, Vol.3, No 3, 1999, pp. 273-275
2. Tereshin V.I. Pulsed plasma accelerators of different gas ions for surface modification. // Rev. Sci. Instrum. – 2002. -V.73. - №2. - P.1- 3.