FORMATION OF THE OXIDE COATING ON THE TITANIUM SURFACE BY MULTIPULSE FEMTOSECOND LASER IRRADIATION[1]

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In our experiments commercially pure titanium VT1–0 with submicrocrystalline structure was used. The femtosecond laser irradiation (FLI) was performed in air using Ti-sapphire laser with a wavelength of 1030 nm and a pulse width of 300 fs at a rate f = 250 kHz and pulse (maximal) energy of 6 μJ. The study of the modified surface of the laser irradiated sample was carried out using a FEI Helios 660 scanning electron-ion microscope and a FEI Quanta 600 scanning electron microscope with field emission. The X-ray diffraction (XRD) studies were performed using a Rigaku SmartLab X-ray diffractometer with the Cu-Kα radiation in a Bragg–Brentano focusing mode. Transmission electron microscopy (TEM) and scanning transmission electron microscopy (STEM) studies of the subsurface structure of the irradiated sample were carried out by using a field-enhanced emission microscope Tecnai G2 F20.

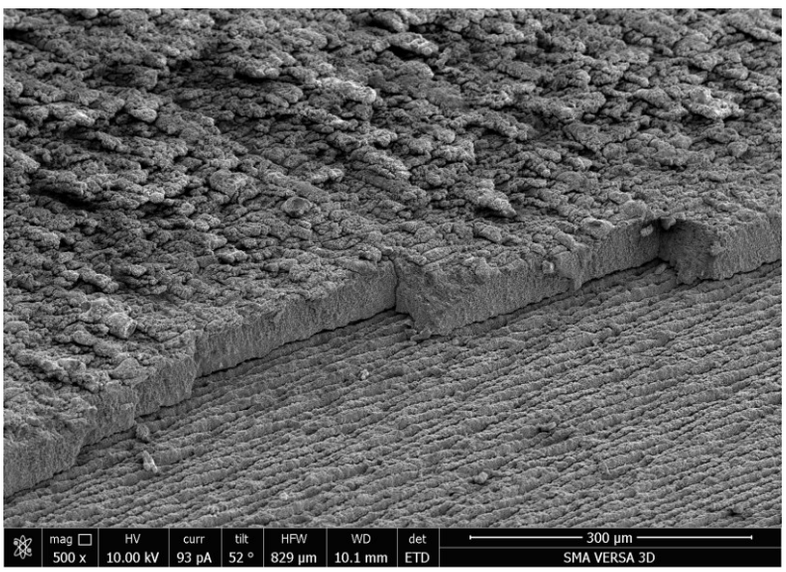

Fig.1. The surface oxide layer formed on titanium by femtosecond laser irradiation. SEM.

The influence of FLI on the formation of an oxide layer on the surface of VT1-0 titanium alloy is studied. It is found that under FLI of the surface of the titanium alloy VT1–0 the microporous nanocrystalline coating with the thickness of ~ 50 μm is formed. According to X-ray diffraction and transmission electron microscopy, this coating consists of titanium oxides: TiO_2 (rutile and anatase), TiO and Ti_3O_5.

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