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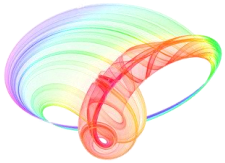

PHOTONICA2019

The Seventh International School and Conference on Photonics, 26 August – 30 August 2019, Belgrade, Serbia

& Machine Learning with Photonics Symposium (ML-Photonica 2019)

& ESUO Regional Workshop

& COST action CA16221

Editors: Milica Matijević, Marko Krstić and Petra Beličev

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CENTER FOR THE PROMOTION OF SCIENCE

Titanium target irradiation by picosecond laser in air and water – surface morphology and synthesis of nanoparticles

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Titanium target was irradiated by picosecond lasers with pulse length of 40 ps i.e. 150 ps in air and water environment. The goal was studying of the induced surface features in both ambiences, as well as synthesis of Ti-based nanoparticles in liquid. Morphologies of the target at both pulse lengths were studied by standard techniques, e.g. scanning electron microscope (SEM) and profilometry, while chemical analysis of the surface was done by energy-dispersive spectrometry (EDS). Interaction ps laser-Ti depends on a number of parameters – laser parameters, condition of the target surface, working ambience, etc. Irradiation conditions in this work were as follows: τ = 40/150 ps, wavelength 1064 nm, pulse frequency 10 Hz, pulse energy 2-20 mJ, pulse count 3000-9000, irradiation in focusing regime. Generally, induced features differ in air and water surrounding – damage is more diffuse in water, with characteristic wavy surface. In both media laser-induced periodic surface structures (LIPSS) are observed on the damage periphery, however they appear at lower pulse count in water. Irradiation of Ti in water led to creation of nanoparticles (NPs) in most cases as established by UV-Vis spectrophotometry, while their size distribution was determined by DLS (dynamic light scattering) analysis. These were, as expected, Ti-oxide NPs as laser ablation in water always leads to formation of oxide particles except in case of noble metals. The size and shape of NPs obtained using laser ablation in liquid (LAL) method depends strongly on the liquid medium used, as well as laser parameters. In our case NPs were spherical, sized from few tens to few hundreds of nanometers, with occurrence of smaller particles in case of 150 ps laser. With further optimization of conditions obtaining of smaller NPs can be expected.

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