Contribution ID: **33** Type: **poster**

Laser peened austenic stainless steel studied by positron annihiliation spectroscopy

Tuesday, 25 June 2019 13:30 (1h 30m)

Laser shock peening (LSP) is a proven surface modification process designed to improve the mechanical properties of materials. LSP is mainly applied on surfaces of metallic components [1]. It consists in irradiating a metallic target surface with a high power density laser beam pulses. The beam heats and ionizes the sample surface, turning it into rapidly expanding plasma which generates a high-pressure shockwave in the target material. It results in severe plastic deformation changes in microstructure and introduces compressive residual stress inside the target material which are reflected by increase in hardness and corrosion resistance [2]. LSP is a promising method for enhancement of biomedical implant components properties [3].

Positron annihilation spectroscopy (PAS) is a well-established method that provides information about changes in micro-structure of the affected subsurface region at the atomic level [4]. Changes in the number and the type of crystal lattice defects are reflected in measured positron annihilation characteristics.

The poster presents preliminary results of positron annihilation spectroscopy studies of the subsurface zone in 316L stainless steel samples subjected to laser peening. By combining chemical removing of the sample layers and measurement of positron lifetime, we obtained the depth profile of defects and determined the affected zone range in the samples after laser processing. The variable energy positron beam (VEP) technique allowed near-surface the depth profiling of defects and obtaining of positron diffusion length in the modified surface layer.

Konrad Skowron acknowledges the support of InterDokMed project no. POWR.03.02.00-00-I013/16

References

[1] Gujba, A.K.; Medraj, M. Materials (2014) 7, 7925-7974.
[2] Ebrahimi, M., Amini, S, Mahdavi Seyed M., Int J Adv Manuf Technol (2017) 88, 1557–1565
[3] Guo, Y.B., Sealy, Michael & Guo, Changsheng, , CIRP Annals - Manufacturing Technology (2012), 61, 583-586
[4] Krause-Rehberg R., Leipner H. S., Positron Annihilation in Semiconductors, Springer-Verlag Berlin Heidelberg (1999)

Primary author: SKOWRON, Konrad (Institute of Nuclear Physics PAN)

Co-authors: Dr DRYZEK, Ewa (Institute of Nuclear Physics PAN); Dr WRÓBEL, Mirosław (AGH University of Science and Technology)

Presenter: SKOWRON, Konrad (Institute of Nuclear Physics PAN)

Session Classification: Poster session