P40 | **Impact of impulse shot peening parameters on properties of stainless steel surface**

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Shot peening (SP), a finishing method for machine elements, was applied to austenitic stainless steel (SS) EN 1.4541. SP was performed at various impact energies (E), impact densities (*j*) and ball diameters (*D*). Changes in the surface layer caused by SP result in its improved microhardness, which increases monotonically with the increase of *E*, *j* and 1/*D*. However, its changes with *E* and *j* achieves saturation at about 400 HV0.5. In contrary, no saturation is observed in the investigated range for 1/*D*.

Our previous studies have shown the properties of unalloyed, bearing and carburizing steels, and aluminum and titanium alloys can be connected to the microstructure of the surface layer revealed by positron annihilation lifetime spectroscopy (PALS) [1,2]. Therefore, the same approach was applied to the stainless steel EN 1.4541. In the un-shot peened 1.4541 SS, lifetime component corresponding to the positron annihilation from delocalized state of positrons in bulk was found. Its lifetime (86 ps) is shortened due to positron trapping in defects, which are represented by the second component with lifetime (164 ps) suggesting that among the defects predominate vacancies on the edge dislocations. In the shot peened 1.4541 SS samples the bulk component is no longer observed. Instead, two types of defects can be identified: vacancy-like defects coupled with edge dislocations (150 ps) and monovacancies or their small clusters (180-190 ps).

In contrary to our previous studies, PALS and hardness testing results do not correspond very well. The most probable reason for this are different depth profiles of both methods. It seems that the defects, which are responsible for the increase of static microhardness above 400 HV0.5 are located mostly below the surface layer penetrated by positrons.

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[2] R. Zaleski, M. Gorgol and K. Zaleski. *Physics Procedia* **35**, 92-97 (2012).