PO2042

Surface layers of steel with improved tribological properties formed using high intense pulse plasma beams (HIPPB)

BOZENA SARTOWSKA[1], Marek Barlak[2], Wojciech Starosta[3], Lech Walis[4]

[1]Inst. of Nuclear Chemistry and Technog., Warsaw, Poland [2]National Centre for Nuclear Research, Otwock/Swierk, Poland [3]Institute of Nuclear Chemistry and Techology, Warsaw, Poland [4]Institue of Nuclear Chemistry and Technology, Warsaw, Poland

b.sartowska@ichtj.waw.pl

Improvement of the wear resistance of material can be achieved using different surface treatment, for example : enrichment of the surface layer with reactive elements or re-solidification techniques using laser, electron or ion beams, including high intensity pulsed plasma beams (HIPPB).
In the last mentioned technique is that energy sufficient to melt near-surface region of the material and ions/atoms presented in plasma are deposited on the substrate by the plasma pulse. Heating and cooling processes were of nonequilibrium type.
HIPPB were generated in the Rod Plasma Injector (RPI). Two Modes of RPI operation were possible: Pulse Implanation Doping (PID) - plasma contains only ions of the working gas and Deposite by Pulsed Erosion (DPE) - beam cosist also ion/atoms eroded from ends of the electrodes.
Surface layer of unalloyed and alloyed steels were treated using HIPPB. The pulse energy densities (2.0 - 5.0 J/cm^2) were high enough to melt the near surface layer of steel. Chosen elements (N, Ar, Ce, La) were introduced to the melted material. Initial and modified surfaces were investigated using scanning electron microscopy (SEM), EDS elemental analysis, X-ray diffraction analysis (XRD, GXRD), Conversion Electron Mossbauer Spectroscopy (CEMS). Tribological properties were investigated using Amsler method.
Improvement of tribological properties for Ar and N treated unalloyes steels were observed due to presence of the nitrogen expanded austenite. Modified with HIPPB surface layers of AISI 316L steel showed imrovement of tribological properties due to nitrogen presence, grain refinement and Ce, La segregation.

Keywords
alloying
austenitic stainless steel
high intensity pulsed plasma beams (HIPPB)
tribological properties
unalloyed steel