MARIA CURIE-SKŁODOWSKA
UNIVERSITY, LUBLIN
LUBLIN UNIVERSITY
OF TECHNOLOGY
WROCŁAW UNIVERSITY
OF TECHNOLOGY

XI-th INTERNATIONAL CONFERENCE

ION IMPLANTATION AND OTHER APPLICATIONS OF IONS AND ELECTRONS

ION 2016

Kazimierz Dolny, Poland
June 13–16, 2016

Local pseudoelastic behavior and surface characteristics of N ion implanted NiTi shape memory alloy

Neonila Levintant-Zayonts[1], *Lech Kwiatkowski*[2], *Zbigniew Swiatek*[3], *Justyna Brzozowska*[2]

[1)] *Institute of Fundamental Technological Research PAS, Pawinskiego 5B, 02- 106 Warsaw, Poland*
[2)] *Institute of Precision Mechanics, Duchnicka 3, 01-796 Warsaw, Poland*
[3)] *Institute of Metallurgy and Materials Science, PAS, Reymonta 25, 30-059 Krakow, Poland*

Due to pseudoelasticity phenomena, shape memory effect and durability in many environments, NiTi shape memory alloys (SMAs) are being intensively adapted for biomedical applications. However, high Ni concentration and its possible release from the surface create a problem of negative effects on biological environment. The main goal of the proposed article is to present results of the effect of nitrogen ion implantation on mechanical and corrosion properties of NiTi SMA. Local pseudoelasticity phenomena of NiTi were determined using ultra low-load applied system. The load–penetration depth curves show that the lower of nitrogen improve mechanical properties in the near surface layer, but higher ion dose (10^{18}j/cm^2) leads to degradation of pseudoelasticity properties.

Corrosion resistance of NiTi carried out in Ringer solution was evaluated by means of electrochemical methods. The results of potentiodynamic measurements in anodic range for indentation system. The indentation curves show that the lower doses (10^{17}j/cm^2) of implanted NiTi indicate a decrease of passive current density range in comparison with non-treated NiTi, without any signs related to Ni release. The results of impedance measurements recorded at the corrosion potential show a capacitive behaviour for all samples without clear predominance of one of them. It can be explained by the fact that this result concerns the first stage of corrosion exposition. It is shown that nitrogen ion implantation leads to a creation of modified surface of improved physicochemical properties with unchanged pseudoelasticity phenomena. Obtained results were correlated with X-ray diffraction techniques.

Acknowledgments
The present research was supported by the National Science Centre (NCN) in Poland under grant no. 2013/09/D/ST8/04011.