

## IMPROVEMENT OF THE TITANIUM WEAR RESISTANCE BY ELECTRON BEAM REMELTING OF THE PRE-DEPOSITED THERMAL SPRAYED COATINGS

### Goal of the project

Improvement of the exploitation performance of the titanium, especially wear behavior, without influencing its good corrosion resistance

### Short description of the project

Titanium is one of the most promising metals in field of high specific strength engineering. Although it offers attractive mechanical, chemical and physical properties, its surface properties are deficient, possessing poor fretting fatigue resistance and poor wear resistance properties. Thermal spray coatings is one of the most common ways to improve the surface characteristics of the materials being used in a wide range of industries to improve the abrasive, erosive, and sliding wear of machine components.

The proposed theme focuses on the improving of the titanium wear resistance by electron beam (EB) remelting of the pre-deposited oxidic powder  $Al_2O_3-TiO_2$  using the high velocity oxygen fuel (HVOF) and atmospheric plasma spraying (APS) methods. The EB treatment may lead to the elimination of porosity, enhancement of the coating strength and chemical homogeneity, and the development of metallurgical bonding at the coating-substrate interface producing strengthened coatings adhesion.

### Project implemented by

University Politehnica Timisoara

### Implementation period

02.09.2013 - 12.12.2016

### Main activities

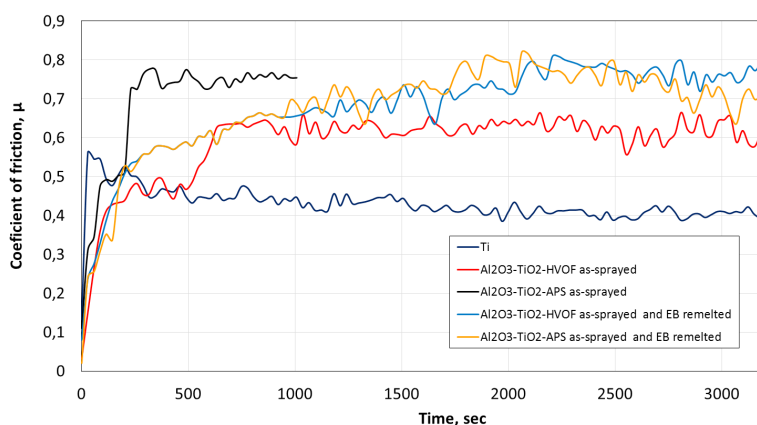
- State of the art and perspectives evaluation in surface coatings technique used as a method in order to improve the wear behavior of the titanium;
- Development of HVOF and APS sprayed  $Al_2O_3-TiO_2$  coatings on the surface of titanium and their remelting using the electron beam (EB) method;
- Analysis and characterization of the obtained HVOF and APS sprayed  $Al_2O_3-TiO_2$  coatings before and after the electron beam remelting treatment;
- Study of the wear and corrosion behavior of the coatings before and after the electron beam remelting;

### Results

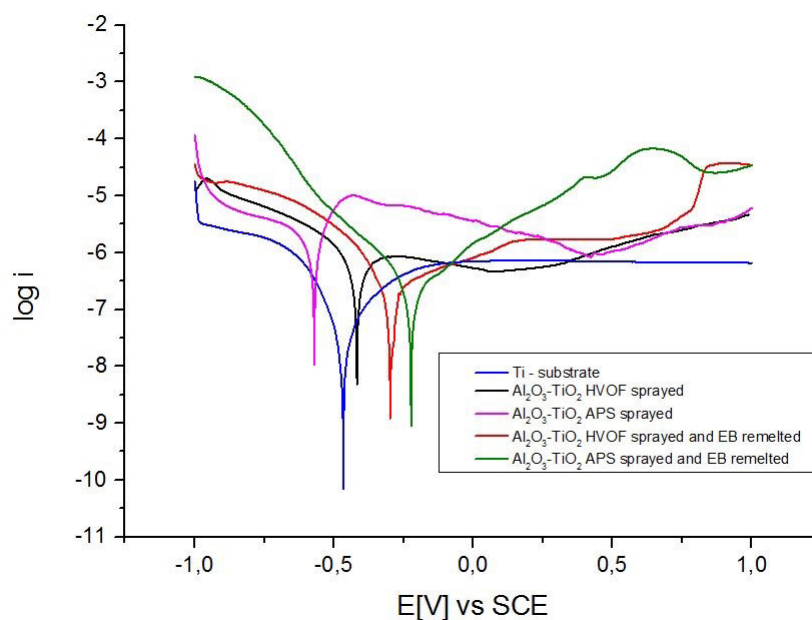
For the final stage of the project it has been obtained the following results:

- Study of the wear and corrosion behavior of the coatings before and after the electron beam remelting;

The results of this project demonstrated that the deposition and EB-remelting of  $Al_2O_3-TiO_2$  coatings onto the titanium surface is a solution for the improvement of sliding wear resistance of this material without a major decrease in corrosion resistance. Moreover, the electron beam treatment can be used for fabrication of compact and homogenous coatings with higher adherence to the substrate.



Evolution of the friction coefficient in time for the tested materials



Potentiodynamic polarization curves of the samples tested in 3.5 % NaCl solution

## Applicability and transferability of the results

The results which will be obtained in frame of the project will be transferred to companies in the field of automotive industry and not only. Also they will be presented to national and international conferences and published in scientific journals.

## Financed through/by

EXECUTIVE UNIT FOR FINANCING EDUCATION HIGHER RESEARCH DEVELOPMENT AND INNOVATION (UEFISCDI)

## Research Centre

Research Centre for Processing and Characterization of Advanced Materials

## Research team

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