# THE ADHERENCE OF $Al_2O_3$ COATINGS DEPOSITED BY ATMOSPHERIC PLASMA SPRAING AND PLASMA ELECTROLYTIC OXIDATION ON AN ALUMINUM ALLOY BASE MATERIAL

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**Abstract:** *This paper presents a comparison between $Al_2O_3$ coatings deposited on an aluminum alloy. The $Al_2O_3$ were deposited by two different methods: atmospheric plasma spray deposition (ASP) and plasma electrolytic oxidation (PEO). The paper analyzes the adhesion of the deposited coatings on the aluminum alloy base material. The adherence test was performed using the "scratch" method with UMTR 2M-CTR type tribometer. To assess the surface roughness, measurements were conducted using Form Talysurf Intra system, manufactured by Taylor Hobson LEICESTER, ENGLAND. Highlighting and interpretation of the results was done using scanning electron microscopy with a Quanta 200 3D DUAL BEAM electron microscope.*

**Keywords:** *$Al_2O_3$, scratch, adhesion, APS method, PEO method*

## 1. Introduction

This paper analyses the way how $Al_2O_3$ coatings, deposited by plasma jet method and plasma electrolytic oxidation, behaves in terms of adherence on an aluminum alloy. [1, 2, 3]

There are various methods to assess the adherence of deposited coatings. The most commune methods used for determining the adhesion between the base material and deposited coating are: the scratch method, indentation with diamond cone method, pull-out method. [1, 4]

The adhesion of coatings deposited by different methods (atmospheric plasma spray deposition, plasma electrolytic oxidation deposition, flame spraying, cold spray, etc.) is important in many industrial applications. Scratch tests provide an understanding of the wear and deformation mechanism to evaluate the performance of coatings. [5, 6, 7]

Scratching test mimics the deformation during machining and sliding contact, which is an important criterion during manufacture and later in applications. [5, 8, 9]

## 2. Materials, methods and instrumentation

The scratch test was conducted on the UMTR 2M-CTR type tribometer which uses three methods to detect the coatings failure. The method used in this paper to assess the analyzed layer is the progressive loading method (PLST - Progressive Load Scratch Test) which consists in applying a force gradually (from 0 to 10N) over the surface of the sample for a defined period of one minute.

The samples used for the scratch test were composed of a aluminum alloy base material on which a successive deposition was made using atmosphere plasma spraying and