

# IMPROVED EROSION RESISTANCE FOR THERMAL BARRIER CERAMIC COATING PROTECT

IBTIHAL A.MAHMOOD<sup>1</sup>, WALAA W. JAMEEL<sup>2</sup> & LUBNA ALAA KHALEEL<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Mechanical Engineering, University of Technology, Iraq

<sup>2</sup>Lecturer, Technical College Baghdad Foundation of Technical Education, Iraq

<sup>3</sup>Technical College Baghdad Foundation of Technical Education, Iraq

## ABSTRACT

The erosion wear resistance of Ni base super alloy (Monel 400) can be improved by thermal sprayed coatings produced by the high velocity oxygen fuel (HVOF). In this work, (Monel 400) is coated with two different types of coatings, the first one is  $\text{Al}_2\text{O}_3+5\% \text{TiO}_2$  and the second is  $\text{Al}_2\text{O}_3 +15\% (7-8\text{YSZ})$ , these layers were made of 350-400  $\mu\text{m}$  as top coat, pre-sprayed with 50-100  $\mu\text{m}$  of 4NiCr5Al as a bond coat. To study the erosion wear behavior of the coatings, erosion test apparatus was designed according to ASTM G-76 also a plan of experiments based on the Taguchi technique is used to acquire the erosion test data in a controlled way. An orthogonal array and signal-to-noise ratio are employed to investigate the influence of the coating materials, impingement angle and stand-off-distance on the erosion rate. The study reveals that the coating materials is the most significant factor influencing the erosion wear rate.  $\text{Al}_2\text{O}_3 +15\% (7-8\text{YSZ})$  has higher wear resistance than  $\text{Al}_2\text{O}_3+5\% \text{TiO}_2$ . Porosity influences their performance when subjected to wear (loss of thickness increased as the porosity increased). The measurement of hardness before and after the wear tests indicates that there was no significant change in either the metal or the coated samples at 300°C for 1 hr. To assess adherence index, porosity and the hardness for the  $\text{Al}_2\text{O}_3 +5\% \text{TiO}_2$  coating are 84%, 9% and 454  $\text{HV}_{0.3}$  respectively while for the  $\text{Al}_2\text{O}_3 +15\% (7-8\text{YSZ})$  coating are 80.1, 17% and 483  $\text{HV}_{0.3}$  respectively.

**KEYWORDS:** Sprayed Coatings, Erosive Wear, Flyash, Alumina-Titania, Alumina-Zirconia, Taguchi Technique