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Development of Wear Resistant Ceramic Coating on Steel Using High Velocity Oxygen Flame Thermal Spray

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Abstract : Hard and dense ceramic coatings deposited on the surface provide the ideal solution to the poor tribological properties exhibited by some popular stainless steels like EN-36, 17-4PH, etc. These steels are widely used in nuclear, fertilizer, food processing, and marine industries under extreme environmental conditions. The present study focuses on the development of Al_2O_3-CeO_2-rGO-based coatings on the surface of 17-4PH steel using High-Velocity Oxygen Flame (HVOF) thermal spray process. The coating is developed using an oxyacetylene flame. Further, we report the physical (Density, Surface roughness, Surface energetics), Metallurgical (Scanning electron microscopy, X-ray diffraction, Raman), Mechanical (Hardness(Vickers and Nano Hard-ness)), Tribological (Wear, Scratch hardness) and Chemical (corrosion) characterization of both As-sprayed coating and the Substrate (17-4 PH steel). The comparison of the properties will help us to understand the microstructure-property relationship of the coating and reveal the necessity and challenges of such coatings.

Keywords : thermal spray process, HVOF, ceramic coating, hardness, wear, corrosion
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