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Microstructural and Tribological Properties of Thermally Sprayed High Entropy Alloys Coating

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Abstract : Nowadays, a group of alloys, namely high entropy alloys (HEA), because of their excellent properties. However, the fabrication of HEAs requires multistage techniques, especially mill-ing, sieving, compaction, sintering, inert media, etc. These processes are laborious, costly, time-oriented, and unsuitable for commercial application. This study adopted a single-stage process-based HVOF thermal spray to develop HEA coating on SS304L substrates. The wear behavior of the deposited HEA coating was explored under different milling time durations (5h, 10h, and 15h, respectively). The effect of feedstock preparation, microstructure, surface chemistry, and mechanical and metallurgical properties on wear resistance was also investigated. The microstructure and composition of both coating and feedstock were evaluated by scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS) analysis. Finally, the phase distribution was correlated by X-ray diffraction (XRD) analysis. The results showed that 15h milled powder coating indicated better tribological than the base substrate and 5h,10h milled powder coating. A chemically stable Body Centered Cubic (BCC) solid solution phase was generated within the 15h milled powder-coated system, which resulted in superior tribological properties.

Keywords : high entropy alloys coating, wear mechanism, HVOF coating, microstructure
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