Wear behavior of single-stage HVOF sprayed TiNbMoMnFe high entropy alloys coating

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Nowadays, a new group of alloys, namely high entropy alloys (HEA), is getting much attention as a new approach to surface engineering. However, the fabrication of HEAs requires multistage techniques, especially milling, sieving, compaction, sintering, inert media, etc. These processes are laborious, costly, time-oriented, and not suitable for commercial application. In this study, a single-stage process-based HVOF thermal spray was adopted to develop TiNbMoMnFe 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, 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. Wear resistance was formulated in terms of coefficient of friction and wear loss. Finally, the phase distribution was correlated by XRD analysis. The results showed that 15h milled powder coating indicated better wear resistance than the base substrate and 5h,10h milled powder coating. A chemically stable BCC solid solution phase was generated within the 15h milled powder-coated system, and which resulted in the higher wear resistance.

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

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