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Effect of Heat Treatment on Friction and Abrasive wear behavior of WC-12Co and Cr_3C_2-25NiCr coatings

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Abstract: The effect of heat treatment (300-950 °C) on friction and abrasive wear behavior of WC-12Co and Cr_3C_2–25NiCr coatings was investigated in the present work. The abrasive wear rate of heat treated coating decreased with increase in heat treatment temperature till 550 ºC at lower loads, whereas an increasing trend was observed at higher loads. The coefficient of friction decreased till 550-750 °C and then showed an increased trend. The phase transformations and variation in mechanical properties predominantly influenced abrasive wear resistance. The friction behaviour of heat treated coatings was rationalized on the basis of relative contribution of mechanical wear and oxidative wear. Severity of contact map was used to identify abrasive wear regime and transitions in wear mechanisms and failure modes.

Keywords: Heat treatment, Microstructure, HVOF coating, Abrasion, Severity of contact

1. Introduction

High Velocity Oxy Fuel (HVOF) sprayed WC-Co and Cr_3C_2-NiCr coatings are used under aggressive environments involving high temperature, corrosion and wear. WC-Co and Cr_3C_2-NiCr coatings are used under different wear situations involving sliding wear (e.g. brake rotors and cylinder liners in automobiles, gas turbine shafts, hydraulic pistons), abrasive wear (aircraft landing gear, pipe and chute liners, rotors in powder mixtures, geo-engineering tool bits, fan blades in cement industries, slurry pumps), and erosive wear (helicopter blades, propellers, fluidized bed combustors, steam and gas turbine, heat exchanger tubing, subsea gate and choke valve in offshore oil industry) [1-9]. The wear performance of carbide based thermal spray coatings is influenced by initial feedstock material, process parameters, carbide size, the extent of decarburization and wear situation [8,10-12].

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