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Corrosion and wear behaviour of HVOF WC-Co-Cr nanostructured and conventional coatings

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Abstract:

Thermal sprayed WC-Co based coatings are widely used for wear and corrosion resistance applications such as aerospace, automotive, biomedical, chemical, power plants etc. applications. Recently, nanostructured cermet thermal spray coatings have attracted great research interest owing to superior hardness and improved wear resistance compared to the conventional coatings, as a result of high grain boundary density. In this work, conventional and nanostructured WC-10%wt Co-4%wt Cr powders were deposited by HVOF (High Velocity Oxygen Fuel) on Al 7075 T6. The nanocoating presented higher porosity (nevertheless, still less than 1%), less decarburization and less oxidation due to the compact grain morphology of the nanopowder feedstock. Its hardness was higher than that of the conventional coating due to the greater specific surface of the carbide phase. Both coatings exhibited high sliding wear resistances. The nanocoating, however, presented even higher wear resistance than the conventional one. Electrochemical tests (cyclic polarization and chronoamperometry) in 3.5% NaCl revealed similar corrosion mechanisms for the nano- and conventional coatings. Both coatings were found susceptible to localized forms of corrosion. The nanocoating showed better performance to salt spray test without any apparent corrosion signs after 45 days of exposure to the salt chamber.