Scanning Speed Effect on the Microstructure, Hardness, Wear, and Corrosion Performance of VC-Cr3C2 Reinforced Laser Claddings on Steel Baseplate for Tillage Application

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Abstract:

The poor tribological property and the high susceptibility of steel material used in mining and tillage tools to wear and corrosion attack during mining and tillage operations have brought about the need to enhance its property. Hence, this study examined the effect of the laser scanning speed on the FeCrV15 coatings' hardness, microstructure, and wear behaviour. In-situ VC-Cr3C2 coatings were made in this comparative study through laser-deposition of high carbon ferrochrome FeCrV15 powder at varying scanning speeds, viz: 8, 10, and 13 mm/ s on steel baseplates. The morphologies of the coatings were analysed with the Scanning Electron Microscope, equipped with Energy Dispersion Spectroscopy (SEM/ EDS), Optical microscope, X-ray diffractometer, Vicker microhardness tester, Anton Paar Tribometer, and Autolab Potentiostat. The study shows defect-free samples with good metallurgical bonding between the clads and the substrate and even distribution of VC-Cr3C2 phases in the microstructure. By increasing the scanning speed, the hardness of FeCrV15 coating reduces, and so is its resistance to corrosion and sliding wear. The production of Insitu VC-Cr3C2 reinforcement is attained by laser deposition of high carbon ferrochrome FeCrV15 powder on steel baseplate, which stands in opposition against abrasive wear, thereby increasing the durability of tillage and mining tools.