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Influence of large particle size – up to 1.2 mm – and morphology on wear resistance in NiCrBSi/WC laser cladded composite coatings

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Abstract

This paper aims at studying the influence of the reinforcement particle size and morphology on the wear resistance properties of NiCrBSi-based composites. Numerous papers have already been written on this subject but almost all of them studied the "conventional" particle size for laser cladding (i.e. between 20 and 200 µm). The objective of this study is to see the influence of coarser reinforcement particles, up to 1.2 mm, and the influence of the morphology (spherical and random shaped) on the coatings erosive and sliding wear resistance. Laser clad coatings were deposited on low carbon steel substrate S235JR with various amounts of WC/W_2C particles up to 50 vol.%. The coatings were processed by using a 3.8 kW High Power Diode Laser (HPDL). Spherical tungsten carbide particles from 40 µm up to 1200 µm were used in this study as well as random shaped particles from 40 µm to 400 µm. To assess the influence of the reinforcement particle properties on wear properties, wheel tests and pin-on-disk tests were performed on each composition. From this study, it can be concluded that there is an obvious advantage in using larger particles (750 – 1200 µm) in harsh conditions while smaller particles (40 – 160 µm) improve the resistance in sliding conditions. The effect of morphology has not been proved significant.

Keywords: Laser cladding; Composites; Particle Size; Morphology; Wear resistance

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