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Transactions of the Institute of Metal Finishing

Volume 94, Issue 4, 3 July 2016, Pages 211-221

Preparation and characterisation of TIG-alloyed hybrid composite coatings for high-temperature tribological applications (Article)

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Abstract

There is an increasing interest in the tribology community for developing **high**-performance **composite coatings** to meet severe **tribological** conditions in advanced mechanical systems which require **high** operating **temperature** and long life. In the present work, powder preplacement and tungsten inert gas (**TIG**) torch melting techniques have been employed to generate titanium carbide (TiC)-based **composite coatings** containing hexagonal boron nitride (hBN) or Ni–P coated hBN (Ni–P-hBN) lubricant additive. The effects of preplaced powder composition on the cross-sectional microstructures and surface hardnesses of the developed **coatings** were analysed. Furthermore, the friction and wear behaviours of the **composite coatings** at 600°C were evaluated using a Ducom ball-on-disc wear test rig. The results indicate that the **TIG**-melted surface containing TiC and Ni–P-hBN powder mixtures exhibits optimum properties combining good control of microstructures and uniformly distributed hardness as well as excellent **tribological** properties due to the enhanced wettability action of Ni–P encapsulated hBN particles. © 2016 Institute of Materials Finishing.

Author keywords

Composite coating; hBN solid lubricant; Low alloy steel; Ni–P deposition; Surface modification; **TIG** torch melting; Tribology

Indexed keywords

Engineering controlled terms: Alloy steel; Boron carbide; Hardness; **High** strength steel; **High temperature applications**; Inert gases; Melting; Microstructure; Nickel; Powder **coatings**; Solid lubricants; Surface treatment; Titanium carbide; Titanium nitride; Tribology; Tungsten carbide

Cross-sectional microstructure; Friction and wear behaviours; Hexagonal boron nitride (h-BN); **High** operating **temperature**; **High** performance **composite coatings**; **TIG** torch; **Tribological applications**; **Tribological** conditions

Engineering main heading: Composite coatings

ISSN: 00202967 **CODEN:** TIMFA **Source Type:** Journal **Original language:** English

DOI: 10.1080/00202967.2016.1182727 **Document Type:** Article

Publisher: Taylor and Francis Ltd.

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