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

By: Bello, KA (Bello, K. A.)[1,2] ; Maleque, MA (Maleque, M. A.)[1] ; Adebisi, AA (Adebisi, A. A.)[1] ; Dube, A (Dube, A.)[3]

TRANSACTIONS OF THE INSTITUTE OF METAL FINISHING
Volume: 94 **Issue:** 4 **Pages:** 211-221 **Special Issue:** SI
DOI: 10.1080/00202967.2016.1182727
Published: 2016
View Journal Information

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 degrees 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.

Keywords

Author Keywords: Surface modification; TIG torch melting; Ni-P deposition; Low alloy steel; hBN solid lubricant; Composite coating; Tribology

KeyWords Plus: WEAR BEHAVIOR; CLAD LAYER; SURFACE; MICROSTRUCTURE; PERFORMANCE

Author Information

Reprint Address: Bello, KA (reprint author)

Int Islamic Univ Malaysia, Dept Mfg & Mat Engn, Darul Salam 53100, Selangor, Malaysia.

Reprint Address: Bello, KA (reprint author)

+ Ahmadu Bello Univ, Dept Met & Mat Engn, Zaria, Nigeria.

Addresses:

[1] Int Islamic Univ Malaysia, Dept Mfg & Mat Engn, Darul Salam 53100, Selangor, Malaysia

+ [2] Ahmadu Bello Univ, Dept Met & Mat Engn, Zaria, Nigeria

[3] Ducom Instruments Ltd, Peenya Ind Area, Bangalore 560058, Karnataka, India

E-mail Addresses: bello.kamilu@live.iium.edu.my

Publisher