Accepted Manuscript

Thick diamond like carbon coatings deposited by deep oscillation magnetron sputtering

SURFACE & COATINGS TECHNOLOGY

Jianliang Lin, Xuhai Zhang, Peter Lee, Ronghua Wei

PII:	S0257-8972(17)30187-1
DOI:	doi: 10.1016/j.surfcoat.2017.02.044
Reference:	SCT 22140
To appear in:	Surface & Coatings Technology
Received date:	26 August 2016
Revised date:	13 February 2017
Accepted date:	15 February 2017

Please cite this article as: Jianliang Lin, Xuhai Zhang, Peter Lee, Ronghua Wei, Thick diamond like carbon coatings deposited by deep oscillation magnetron sputtering. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Sct(2017), doi: 10.1016/j.surfcoat.2017.02.044

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Thick diamond like carbon coatings deposited by deep oscillation magnetron sputtering

Jianliang Lin^{*^a}, Xuhai Zhang^b, Peter Lee^a, Ronghua Wei^a

^a Southwest Research Institute, San Antonio, TX 78238, USA

^b Jiangsu Key Laboratory of Advanced Metallic Materials, School of Materials Science and Engineering, Southeast University, Nanjing 211189, China

Abstract:

Hydrogenated diamond like carbon (DLC) coatings with thicknesses up to 20 µm have been deposited on metal substrates by sputtering a graphite target in argon (Ar) and acetylene (C₂H₂) mixture using deep oscillation magnetron sputtering (DOMS). The coatings were deposited under moderate peak target current densities (0.47 to 0.6 Acm⁻²) at a low bias voltage of -60 V, to achieve dense microstructure but avoid building up of high residual stresses. Higher peak substrate current densities and deposition rates were found when C₂H₂ was introduced. The effects of the C₂H₂ flow rate (f_{C2H2}) on the deposition rate, microstructure, adhesion, mechanical and tribological properties of the DLC coatings were studied by means of scanning electron microscopy, Raman spectroscopy, HRC indentation, nanoindentation, dry ball-on-disk test, and block-on-ring test in SAE 10W-30 engine lubricant. The coatings showed low compressive stresses in the range of -0.5 GPa to -1.8 GPa. The coatings exhibited dense structure, high sp^3/sp^2 ratio, and excellent wear resistance when the C₂H₂ flow rate was in the range of 10-20 sccm (4%-8% of the total gas flow). However, the coatings deposited at higher C_2H_2 flows (>30 sccm or 13% of the total gas flow) showed decreased adhesion, hardness and wear resistance. The friction and wear behavior of the DOMS DLC coatings both in the ambient air and SAE 10W-30 engine lubricant showed positive results in terms of friction and wear reduction.

Key words: Diamond like carbon (DLC), deep oscillation magnetron sputtering (DOMS), high power impulse magnetron sputtering (HiPIMS), acetylene, low friction, wear.

*Corresponding author. Tel:+1-210-522-5183, fax: +1-210-522-6220 E-mail address: jlin2012@me.com (J. Lin) Download English Version:

https://daneshyari.com/en/article/5464683

Download Persian Version:

https://daneshyari.com/article/5464683

Daneshyari.com