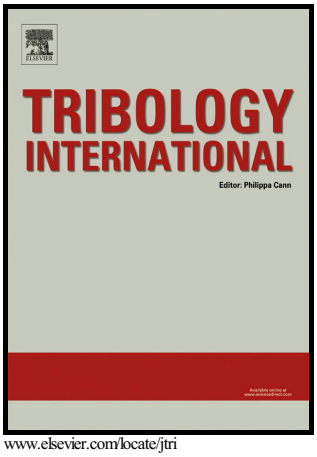
Tribological behavior and mechanism of self-lubricating wear-resistant composite coatings fabricated by one-step plasma electrolytic oxidation

Bing Yin, Zhenjun Peng, Jun Liang, Kongjie Jin, Shengyu Zhu, Jun Yang, Zhuhui Qiao



www.elsevier.com/locate/jtri

PII: S0301-679X(16)00032-3
DOI: http://dx.doi.org/10.1016/j.triboint.2016.01.020
Reference: JTRI4031

To appear in: *Tribiology International*

Received date: 27 October 2015
Revised date: 7 January 2016
Accepted date: 9 January 2016

Cite this article as: Bing Yin, Zhenjun Peng, Jun Liang, Kongjie Jin, Shengyu Zhu, Jun Yang and Zhuhui Qiao, Tribological behavior and mechanism of self-lubricating wear-resistant composite coatings fabricated by one-step plasma electrolytic oxidation, *Tribiology International* http://dx.doi.org/10.1016/j.triboint.2016.01.020

Tribological behavior and mechanism of self-lubricating wear-resistant composite coatings fabricated by one-step plasma electrolytic oxidation

Bing Yin, Zhenjun Peng, Jun Liang, Kongjie Jin, Shengyu Zhu, Jun Yang, Zhuhui Qiao*

State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, China

Abstract

The productions of self-lubricating alumina-graphite composite coatings were prepared through one-step plasma electrolytic oxidation in an appropriate graphite-dispersed electrolyte solution, and the microstructure, composition and phase constituents were examined. The friction and wear properties were investigated by sliding the disk samples against Si_3N_4 balls under dry and deionized water conditions, respectively. Molecular dynamics simulations about the interface states of graphite were also carried out to assist in the evaluation of the self-lubricating and wear-resistant mechanisms, making up the weakness of the conventional experimental method in microscopic study. The results indicated that the oxidation coatings greatly improved the wear resistance of pure aluminum. Further improvement in the wear resistance was achieved by self-lubricating of solid lubricant in oxidation coatings. In wear process, the wear debris aggregated together on the worn surface and the graphite particles formed layered structures, which exhibited excellent self-lubricating behavior and decreased the shear stresses generated by the moving stylus.

* Corresponding author. Tel.: +86 0931 4968193.

E-mail address: zhqiao@licp.cas.cn (Zhuhui Qiao).