

Accepted Manuscript

A tribo-oxidation abrasive wear model to quantify the wear rate of a cobalt-based alloy subjected to fretting in low-to-medium temperature conditions

Alixé Dréano, Siegfried Fouvry, Gaylord Guillonéau



PII: S0301-679X(18)30225-1

DOI: [10.1016/j.triboint.2018.04.032](https://doi.org/10.1016/j.triboint.2018.04.032)

Reference: JTRI 5211

To appear in: *Tribology International*

Received Date: 1 November 2017

Revised Date: 5 April 2018

Accepted Date: 26 April 2018

Please cite this article as: Dréano A, Fouvry S, Guillonéau G, A tribo-oxidation abrasive wear model to quantify the wear rate of a cobalt-based alloy subjected to fretting in low-to-medium temperature conditions, *Tribology International* (2018), doi: 10.1016/j.triboint.2018.04.032.

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.

A tribo-oxidation abrasive wear model to quantify the wear rate of a cobalt-based alloy subjected to fretting in low-to-medium temperature conditions

Alixé Dréano*, Siegfried Fouvry, Gaylord Guillonéau

University of Lyon, Ecole Centrale de Lyon, LTDS UMR 5513 CNRS, Ecully, France

* alixe.dreano@ec-lyon.fr

Abstract

Wear mechanisms of cobalt-based alloys are commonly known to be dependent on temperature: above a glaze layer transition temperature, wear rates are very low and a compacted oxidized compliant debris layer is spontaneously created in the contact. The present study focuses on the high wear rate mechanism occurring below this transition temperature of a HS25/alumina contact subjected to gross-slip fretting. The investigation shows that the wear volume is proportional to the product of the Archard's work multiplied by the oxide thickness generated between each fretting sliding pass. A simple tribo-oxidation wear model was developed and a very good correlation was observed with experiments as long as the compaction of debris layer leading to a glaze layer structure was not activated.

Keywords

fretting; oxidative wear; abrasive wear; wear transition

1. Introduction

Cobalt-based alloys (Stellite, Haynes) are commonly used in industry for their good mechanical properties and resistance to corrosion [1]. The Haynes alloy contains a Cr-Ni-W-C solid solution embedded in a cobalt matrix where chromium provides strength and corrosion resistance by creating carbides and a thick protective layer of chromium oxides Cr_2O_3 [2]. The presence of tungsten promotes additional hardening due to solid solution and the formation of carbides which enhance corrosion resistance by its "non-oxidation condition" [2]. Finally, the addition of nickel ensures that the alloy has a good ductility. Microstructure and phase transformations also have an important role on resistance to sliding wear. First, the presence of hard phases in the cobalt matrix promotes high-temperature resistance [2,3]. Second, Co-based alloys exhibit a phase transformation from FCC to HCP down to a depth of several micrometers below the surface [4], which is promoted by

Download English Version:

<https://daneshyari.com/en/article/7001611>

Download Persian Version:

<https://daneshyari.com/article/7001611>

[Daneshyari.com](https://daneshyari.com)