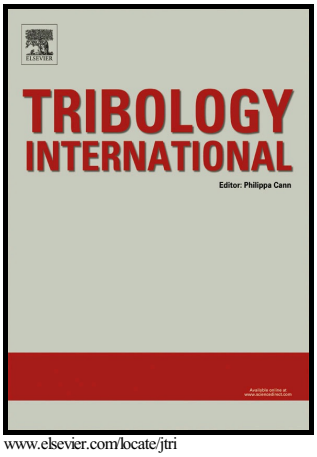
Effects of oil-in-water based nanolubricant containing TiO_2 nanoparticles on the tribological behaviour of oxidised high-speed steel

Wenzhen Xia, Jingwei Zhao, Hui Wu, Sihai Jiao, Zhengyi Jiang



www.elsevier.com/locate/jtri

PII: S0301-679X(17)30073-7
DOI: http://dx.doi.org/10.1016/j.triboint.2017.02.013
Reference: JTRI4594

To appear in: *Tribiology International*

Received date: 6 December 2016
Revised date: 23 January 2017
Accepted date: 12 February 2017

Cite this article as: Wenzhen Xia, Jingwei Zhao, Hui Wu, Sihai Jiao and Zhengy Jiang, Effects of oil-in-water based nanolubricant containing TiO_2 nanoparticle on the tribological behaviour of oxidised high-speed steel, *Tribiolog International,* http://dx.doi.org/10.1016/j.triboint.2017.02.013

Effects of oil-in-water based nanolubricant containing TiO_2 nanoparticles on the tribological behaviour of oxidised high-speed steel

Wenzhen Xia[a], Jingwei Zhao[a], Hui Wu[a], Sihai Jiao[b], Zhengyi Jiang[a,c*]

[a]School of Mechanical, Materials and Mechatronic Engineering, University of Wollongong, NSW 2522, Australia

[b]Baosteel Research Institute, Baoshan Iron & Steel Co Ltd., Shanghai 200941, China

[c]School of Materials Science and Metallurgy, University of Science and Technology, Liaoning, Anshan 114051, China

wx717@uowmail.edu.au

jwzhaocn@gmail.com

jiang@uow.edu.au

[*]Corresponding author. Tel.: +61 2 4221 4545; fax: +61 2 4221 5474.

Abstract

In this work, the effects of the developed oil-in-water (O/W) based nanolubricants containing TiO_2 nanoparticles (NPs) on the tribological behaviour of oxidised high-speed steel (HSS) were studied, using pin-on-disc tests. The pin was made of HSS and, prior to the wear test, was oxidised to form a scale layer on the surface. The results show that the TiO_2 NPs in the O/W lubricant can achieve an excellent reduction of the coefficient of friction (COF) and improve the anti-wear properties of pins with oxidised surfaces. The TiO_2 NPs in the nanolubricant were found to have the filling and tribo-sintering effects. The NP aggregation around the contact area was observed with higher TiO_2 NP concentrations in the nanolubricant, revealing a larger NP aggregation area. Based on the results and analysis, the mechanism about the effects of the TiO_2 NPs in the O/W based nanolubricant on the wear and COF were well explained.