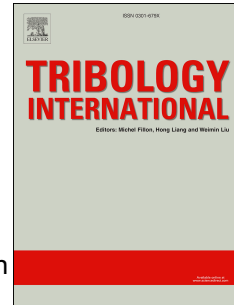


Accepted Manuscript

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PII: S0301-679X(18)30041-0

DOI: [10.1016/j.triboint.2018.01.041](https://doi.org/10.1016/j.triboint.2018.01.041)

Reference: JTRI 5072

To appear in: *Tribology International*

Received Date: 3 November 2017

Revised Date: 12 January 2018

Accepted Date: 17 January 2018

Please cite this article as: Miao X, Hu M, Li A, Wang D, Weng L, Li X, Zhang G, Investigation on the lubricity of self-lubricating ball bearings for cryogenic turbine pump, *Tribology International* (2018), doi: 10.1016/j.triboint.2018.01.041.

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Investigation on the lubricity of self-lubricating ball bearings for cryogenic turbine pump

Xusheng Miao¹, Ming Hu^{2,*}, Aimin Li³, Desheng Wang², Lijun Weng²,
Xiangyang Li³, Guitian Zhang¹

- ^{1.} *Science Technology on Combustion, Internal Flow and Thermal-structure Laboratory, Northwestern Polytechnical University, Xi'an 710012, PR China*
- ^{2.} *State Key Laboratory of Solid Lubrication, Lanzhou institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, PR China*
- ^{3.} *Xi'an Aerospace Propulsion Institute, Xi'an 710012, PR China*

Abstract

The lubricity of newly designed self-lubricating 70-mm-bore angular contact ball bearings was tested using a special bearing tester under thrust load of about 20 kN and speed of about 20000 r/min in liquid nitrogen. The test bearing was characterized with the pure polytetrafluoroethylene (PTFE) retainer coupled with the Ag-based lubricant film initially deposited on bearing raceways. After running for 1200 and 2400 seconds respectively, the states of the PTFE transfer films on the surfaces of the balls and raceways as well as the wear state of the Ag-based solid lubricant film for each tested bearing were analyzed mainly by scanning electron microscopy and X-ray photoelectron spectroscopy. The results indicated that good lubricating conditions were obtained for all tested bearings. The newly designed self-lubricating ball bearing could run steadily for more than 2400 seconds under high speed, heavy load and at cryogenic temperature conditions. The formation and the evolution of PTFE transfer films with bearing operation are mainly discussed according to the relevant analysis.

Keywords: Rocket-turbopump; Self-lubricating ball bearing; PTFE transfer film; lubricating performance

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