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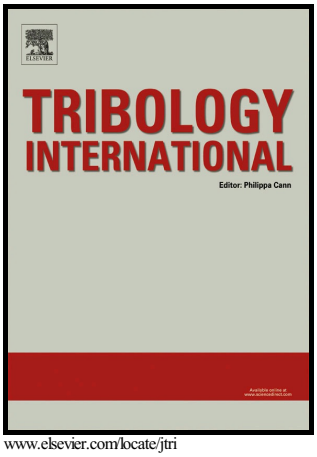

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PII: S0301-679X(17)30090-7
DOI: http://dx.doi.org/10.1016/j.triboint.2017.02.030
Reference: JTRI4611

To appear in: *Tribiology International*

Received date: 2 January 2017
Revised date: 13 February 2017
Accepted date: 20 February 2017

Cite this article as: D. Muller, C. Matta, R. Thijssen, M.N. bin Yusof, M.C.P. van Eijk and S. Chatra, Novel polymer grease microstructure and its propose lubrication mechanism in rolling/sliding contacts, *Tribiology Internationa* http://dx.doi.org/10.1016/j.triboint.2017.02.030

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D. Muller, C. Matta, R. Thijssen, M. N. bin Yusof, M. C. P. van Eijk and S. Chatra

SKF Engineering & Research Centre, 3430DT Nieuwegein, the Netherlands

Abstract

A novel polymer grease micro-structure is revealed using scanning electron microscopy (SEM), cryogenic scanning electron microscopy (cryo-SEM) and transmission electron microscopy (TEM). The structure consists of amorphous polypropylene nano-particles uniformly distributed in the base oil. This novel microstructure has never been documented before. Rheology shows that there is no irreversible shear-thinning. The grease shows excellent stability and flow behaviours. In the absence of crystallization and a network thickener structure, it has a potential for use at extremely low start-up temperatures. Spherical roller bearing (SRB) testing shows excellent lubricating performance and the potential for lowering friction in comparison with benchmark greases. It is hypothesized that the grease behaves as a highly stable nano-fluid allowing abundant oil replenishment into the rolling contact, whereby nanoparticles are released with the base oil in the contact.

Keywords: grease, polymer, polypropylene, PTFE, lithium, thickener, TEM, cryo-SEM, microstructure, rheology, yield stress, bearing testing, Lubrication mechanism, nano-particles.

List of symbols

G'	Pa	Storage modulus
G''	Pa	Loss modulus
G^*	Pa	Complex modulus
T	°C	Temperature