CHANGES OF AQUEOUS SOLUTION OF POLYETHYLENE GLYCOL FILM THICKNESS IN EHD CONTACTS

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ABSTRACT
Polyhydric alcohols are lubricants with low pressure-viscosity coefficients [1]. Therefore, they are suitable for usage as water-based lubricants in superlubricity [2] (coefficient of friction < 0.01). And it is assumed some acids could cause protonation of surfaces and also react with polyglycols and increase viscosity of solutions after all [3]. These changes were observed as part of running-in, in which the coefficient of friction decreased and chemical changes was proved after it by spectroscopic analysis. Most of researches were performed in pure sliding conditions and only coefficient of friction was observed *in situ*.

The optical insight into the contact, respective into the lubricant film is extension which could help in understanding of formation of film and changes in it – especially in transitioning from elastohydrodynamic (EHD) to mixed lubrication. Tribometer with configuration ball-on-disc was used in the following experiments. Si_3N_4 ball and glass disc (with or without Cr layer) were chose as contact materials. Images of contact were processed by colorimetric interferometry, so the film thickness was observed *in situ* and viscosity changes could be estimated from it.

Through these experiments it was find out the film thickness of polyethylene glycol with molecular weight 200 g/mol (PEG200) has almost Newtonian behavior. The film thickness can be also predicted by famous Hamrock-Dowson formula in pure EHD regime. Some abrupt thickness changes were also observed when the contact approached mixed lubrication regime.

Other changes were detected when the boric acid was used as an additive in the PEG200 water solution (like Ge et al. presented [3]). This change was caused by viscosity increase during the running-in. Film thickness abrupt changes were sometimes observed with changing speed like without boric acid (Fig. 1).

Superlubricity friction in contact lubricated by PEG200 could be measure in EHD contacts and the film thickness could be predicted until the abrupt change appears. Then the viscosity of lubricant is probably changed. These interesting changes may help explain the behavior of water-based lubricants in superlubricity.

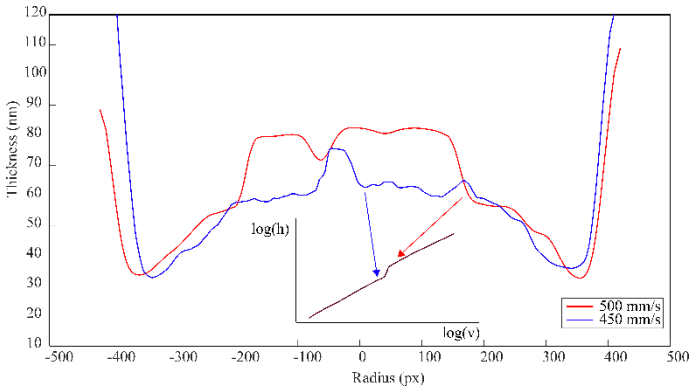

Fig.1 Abrupt changes of film thickness

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