

Title	Water lubrication improved by low-friction proteins (abstract)
Author(s)	Hakala, Timo, J.; Laaksonen, Päivi; Linder, Markus; Ahlroos, Tiina; Helle, Aino; Holmberg, Kenneth
Citation	38th Leeds-Lyon Symposium on Tribology - Energy and Health, Lyon, 6-9 September 2011
Date	2011
Rights	This article may be downloaded for personal use only

VTT
<http://www.vtt.fi>
P.O. box 1000
FI-02044 VTT
Finland

By using VTT Digital Open Access Repository you are bound by the following Terms & Conditions.

I have read and I understand the following statement:

This document is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of this document is not permitted, except duplication for research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered for sale.

Water lubrication improved by low-friction proteins

Hakala T.J., Laaksonen P., Linder M.B., Ahlroos T., Helle A. and Holmberg K. ^a

^aVTT Technical Research Centre of Finland

1. ABSTRACT

Water has poor boundary lubrication properties and it is corrosive for steel surfaces. Those are main reasons why water is not used as a lubricant in applications that work under high contact pressures and low speeds. However, water has also advantages as a lubricant; water is always available, it has good thermal conductivity and it is not environmentally hazardous.

Requirements for water lubrication additives are good adsorption on the surface to increase the wettability, good stability and ability to improve the corrosion resistance. Using proteins as additives is one possible way to improve the lubricating properties of water. Proteins like albumin and mucin are well known of their adsorption ability to the surfaces and they have been widely studied around the world. However, there are also other proteins that can work as additives in water lubrication that have not been investigated.

We investigated the possibility of different kinds of hydrophobin protein molecules to be used as additives in water lubrication and improve its properties to work as a lubricant in boundary

lubrication regime. Hydrophobins are small amphiphilic proteins produced by filamentous fungi. Here, lubricative properties of a class II hydrophobin, HFBI and its variants were studied. Hydrophobins were produced by recombinant microbial production methods and purified by two-phase extraction followed by chromatographic purification. Adsorption of proteins to the steel surface was studied by QCM, wettability by contact angle measurements and the tribological properties by using pin-on-disc tribometer. The pin-on-disc tests were carried out with AISI420 steel ball and AISI440B disc in a pin-on-disc device. We tested different speeds from 10 to 100 mm/s and loads from 2 to 20 N to find the parameters to ensure the regime of boundary lubrication.

Differences in lubricating properties of different kinds of hydrophobin molecules and their dependence on different test parameters and solution conditions are reported as well as low-friction properties with a coefficient of friction below 0.1.