On the chemical nature of boundary lubrication of stainless steel by chlorine - and sulfur-containing EP-additives - DTU Orbit (12/10/2019)

The nature of the extreme pressure (EP) effect of the dialkylpolysulfides and chlorinated paraffins during the ironing of stainless steel AISI 304 has been studied. A strip reduction test was used in combination with differential thermal analysis (DTA), profilometry, X-ray photoelectron spectroscopy (XPS) and Auger electron spectroscopy analysis (AES).

Strip reduction tests, in which chlorinated paraffin and dialkyl sulfide were compared as EP-additives, have shown significantly stronger EP-effect of the chlorine containing lubricant, than for the sulfur containing lubricant. DTA analysis of the Me-powder (where Me = iron, chromium or nickel)-dialkylpolysulfide (or chlorinated paraffin) mixtures have shown that dialkylpolysulfide was chemically active with iron and nickel (the highest activity was with nickel). Chromium was practically nonactive with dialkylpolysulfide. Chlorinated paraffin was equally active with iron, chromium and nickel.

The better lubrication performance demonstrated by chlorinated paraffin compared to dialkylpolysulfides was attributed to the chemical activity of the chlorinated paraffin with all the main components of stainless steel.

The depth profiles of the stainless steel strips were examined before and after strip reduction by use of AES sputter profiling. Results imply that the chlorine containing lubricant enforces the formation of a thick oxide layer. (C) 2000 Elsevier Science S.A. All rights reserved.

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