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Wednesday, May 18, 2011

Session 5B: Nanotribology V - Nanolubricants II

Session Chair: A. Erdemir, Argonne National Laboratory, Argonne, IL

Session Co-Chair: J. W. Choo, Petronas Research Sdn Bhd, Selangor, Malaysia

11 - 11:30 am

Evolution of ZDDP-derived Reaction Layer Morphology With Rubbing Time

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Functional additives, particularly extreme-pressure and antiwear additives, in formulated oil will compete to adsorb and function in tribological contacts. A low polarity commercial base oil, poly- α -olefin (PAO), blended with zinc dialkyl dithiophosphates has been studied. The tribological performance was evaluated using a ball-on-disc test rig under mixed rolling-sliding conditions in the boundary lubrication regime. An adapted in-situ interferometry technique was used to monitor the additive derived reaction layer formation. The thickness of the reaction layer evolves with rubbing until reaching a limiting thickness value of approximately 70nm. The evolution of the topography and mechanical properties of the ZDDP-derived reaction layer with rubbing time were studied using Atomic Force Microscopy. A constant roughening and hardening of the additive-derived layer with rubbing time is observed and related to the different tribological performance of the layer at different rubbing times.