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Lubricating Mechanism of Cyano-based Ionic Liquids on Nascent Steel Surface

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Abstract

This study investigates the lubricating mechanism of cyano-based ionic liquids on steel surfaces using Q-MS, ToF-SIMS, and TGA. [EMIM][DCN], [EMIM][TCC], [EMIM][TCB], [BMPL][DCN], [BMPL][TCC], and [BMPL][TCB] were selected as lubricants.

[EMIM][TCB] exhibited the highest friction coefficient. The others exhibited very low friction coefficients of less than 0.08. Q-MS analysis indicated that the cation components were detected in outgassing during sliding tests. However, anion components were not detected. ToF-SIMS results showed that the anions remained on the worn surfaces which would lead low friction coefficients. To achieve low friction coefficient, the tribo-decompostion of the ionic liquids and adsorption of anion were required. TGA indicated thermal stability was an index for tribo-decomposition on the nascent steel surface.

Keywords: Q-MS, ToF-SIMS, TGA, Ionic liquids