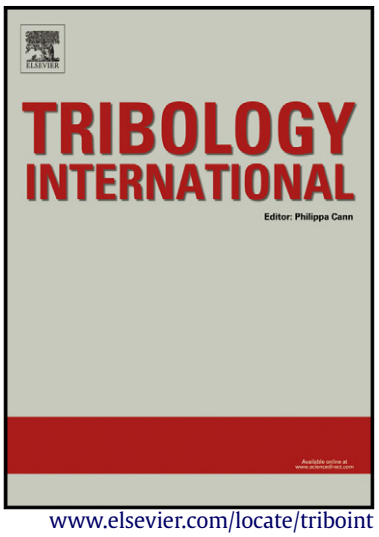

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Comparison of an Oil-Miscible Ionic Liquid and ZDDP as a Lubricant Anti-Wear Additive

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Abstract

This paper reports the anti-scuffing/anti-wear behavior and mechanism of an oil-miscible ionic liquid (IL), trihexyltetradecylphosphonium bis(2-ethylhexyl)phosphate, in a base oil at 1.0 wt% concentration under both room and elevated temperatures. Results are benchmarked against those for a conventional anti-wear additive, zinc dialkyl-dithiophosphate (ZDDP). Reciprocating sliding, boundary lubrication tests were conducted using a piston ring segment against a cylinder liner piece cut from actual automotive engine components. Although the IL and ZDDP worked equally well to prevent scuffing and reduce wear in the room-temperature tests, the IL significantly outperformed ZDDP in the 100 ^{o}C tests. The top surfaces and cross sections of the worn surfaces were characterized to reveal the morphology, thickness, nanostructure, and chemical composition of the IL-induced tribo-films.

Keywords: oil-soluble ionic liquid, lubricant, additive, anti-wear, tribo-film, ZDDP

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