On the lubrication mechanisms of ionic liquids

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Phosphonium ionic liquids are considered in terms of their interfacial film formation, both physisorbed and sacrificial from chemical breakdown, in sheared contacts of varying harshness. The methods to detect non-sacrificial films are discussed. Challenges with solubility of ionic liquids in oils are addressed. Ionic liquids can enhance performance of base oils and outperform reference oils as lubricants; in some cases, sacrificial films are formed (with anion breakdown a necessary precursor to phosphonium cation decomposition) while in other cases, a protective, self-assembly lubricant layer or hybrid film is formed. Surface topography also influences tribofilm formation and the degree of breakdown through enhanced material transport and replenishment. This talk unveils the relationship between ionic liquid composition and structure, and the ensuing inter- and intra-molecular interactions and chemical stability, and demonstrates the intrinsic tuneability of an ionic liquid lubrication technology.