Halogen-Free Ionic Liquids: Designed Chemistry to Tribological Applications

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Remarkable and Tunable Properties of Ionic Liquids

- **Broad liquid range:** Improves pour point
- **Low volatility:** Protect environment
- **High thermal stability:** Good for high temperature lubricant applications
- **Non-flammability:** More convenient to handle, transport and store
- **High viscosity:** Improves viscosity index
- **Excellent conductivity:** Take away heat from the contact surfaces
- **Inherent polar nature:** Forms the thin film, reduces friction and wear
- **Flexible Molecular Structure:** Diversified range of cations / anions make ionic liquids as versatile lubricants for different engineering surfaces

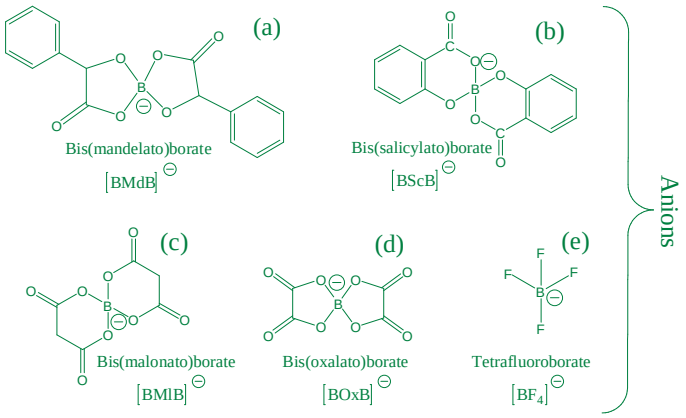
Drawbacks of Halogenated and phosphorus-containing Ionic Liquids ?

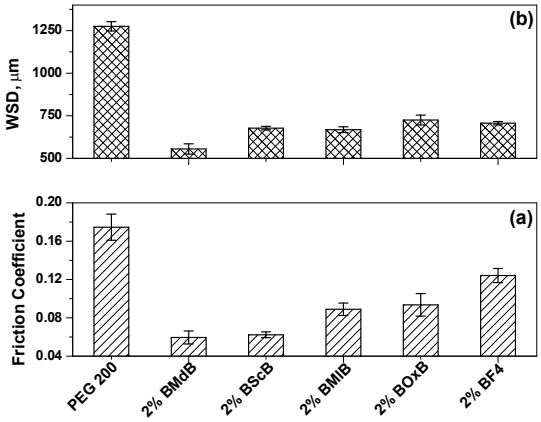
- High Costs of alkali salts of halogen-precursors (particularly fluoride)
- Hydrolysis of halogenated ionic liquids leads to corrosive events
- Disposal /degradation of conventional ionic liquids in eco-friendly patterns
- Toxicity to aquatic wildlife, adverse effects to human-health and poisoning of automotive exhaust gas catalyst components owing to phosphorus

Targeted Properties: Friction-reduction, Wear-preventive, Corrosion-Inhibition

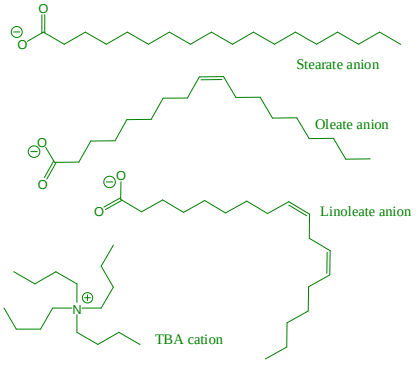
Few Examples:

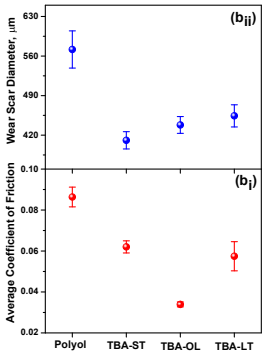
(a) Chelated orthoborate anion based imidazolium / ammonium ionic liquids



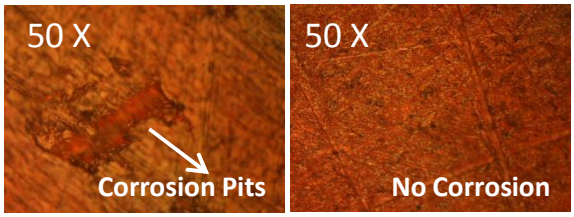


(b) Fatty acid anions based ionic liquids





(c) Bisimidazolium bis(salicylato)borate ILs



2% MIM5-PF_6 in PEG200 2% MIM5-BScB+ PEG200