NanoTechLabs' Ionic Lubricants

NanoTechLabs
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Few mechanical systems exist today where one material does not move relative to another. Due to this motion, a potential exists for friction and perturbations to cause wear and tear especially if the moving parts have been hardened to withstand external stresses. Lubricants oils and greases are employed to lessen the impact of friction and perturbations and thereby increase the useful life of mechanical systems in addition to reducing down-time and energy consumption. Viscosity is arguably the most important property of a lubricant and represents a measure of a liquid's resistance to flow. A wide range of viscosities are in use today from 2.2 cSt to 3200 cSt with operating environments and application specific considerations determining the chosen lubricant.

Lubricating oils are used in applications with low to middle range rotational velocities and loads. They are commonly divided into two categories: mineral and synthetic. Mineral-based oils are extracted from crude oil and segregated according to similar boiling point ranges at refineries (indicative of the hydrocarbons present). The separate distillates are then cleaned and added together in certain proportions to create lubricating oils with the desired viscosity. Mineral-based oils enjoy widespread use due to their low price, class-wide compatibility, and adequate lubricating properties. However, mineral-based oils are environmentally unfriendly, possess limited useful lives, and perform adequately only within limited temperature ranges.

Synthetic lubricants, on the other hand, are specialty chemicals engineered to replicate the benefits of mineral-based oils without the disadvantages. Synthetic lubricants perform better in extreme temperature ranges (below -60°C and above 200°C) over longer lifetimes within lower tolerances.

Built upon an ionic liquid platform, NanoTechLabs' ionic lubricants, developed in collaboration with Wake Forest University's Department of Chemistry, perform well under a wide range of loads in addition to maintaining lubricating properties over a wide temperature range. They are

- Environmentally friendly - NanoTechLabs' ionic lubricants emit no toxic fumes in high temperatures, and possibilities exist to create these from renewable ingredients.
- Inflammable
- Non-volatile through negligible vapor pressure - NanoTechLabs' ionic lubricants will not evaporate in low pressure environments and they do not boil.
- More cost-effective than most competitors
- Capable of operating at wider temperature ranges than competitors (-60 C to 500 C)
- Flexible in design to allow materials to tailored for application environment

Applications

There are many high-performance applications for ionic lubricants in terrestrial as well as space environments including:

- Engine Oils
- Turbine Oils
- Bearing Oils
- Compressor Oils
- Way Oils
- Chain Lubricants
- Hydraulic Oils
- MEMS

Parameters and Attributes

	[EMIM][BF4]	[BMIM][BF4]	[DPMI]Im
Density at 60°C	1.3	1.2	1.4
Freezing points	14.4	-87.4	11.3
Thermal decomposition onset	445.5	423.7	457.0
Heat capacity at 100°C	1.3	1.7	1.2
Heat of fusion	48.2	--	47.0
Heat storage density, sensible 100°C	160.9	194.9	169.9
Heat storage capacity, latenta	60.4	--	66.7
Vapor pressure	<< 1 atm	<< 1 atm	<< 1 atm
Thermal conductivity (298K)	0.20	0.19	0.13
Viscosity (298K)	36.0	119.8	90.1

More Information

For more information about ionic lubricants, contact us.

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