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## BISMUTH ADDITIVES FOR SILICON OILS AS A “GREEN” ALTERNATIVE

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**F**luids formulations with good properties were developed by using an environmentally friendly additive. The performance of these formulations was studied at high and low contact pressure conditions on steel/steel and polymer/steel systems. Bismuth (III) sulfide powder ( $\text{Bi}_2\text{S}_3$ ) was obtained by employing solvothermal synthesis procedures. An orthorhombic crystal lattice (DRX) and a high-purity product (FRX) was evidenced for the powder obtained, which was added to a vinyl-terminated silicone fluid to obtain different wt% mixtures. The tribological performance of the formulations prepared was studied from Reichert's (steel/steel system) and block on ring (polymer/steel tests), according to standardized methodologies. The results obtained for these formulations were compared with those formulations prepared with commercial  $\text{Bi}_2\text{S}_3$ , commercial molybdenum (IV) sulfide ( $\text{MoS}_2$ ) and graphite. Lubricity properties increased when wt% of solvothermal  $\text{Bi}_2\text{S}_3$  increased. The wear area decreased up to 90% according to Reichert's tests. In addition, it was observed that solvothermal  $\text{Bi}_2\text{S}_3$  shows a better tribological behavior when compared to commercial  $\text{Bi}_2\text{S}_3$ ,  $\text{MoS}_2$ , and graphite. These results show the possibility to replace lead (Pb) or molybdenum (Mo) derivatives in lubricants' formulations by an environmentally friendly additive, suitable for extreme pressure (EP) formulations. Moreover, solvothermal  $\text{Bi}_2\text{S}_3$  displayed an excellent performance in silicon oil formulations when compared to commercially used additives that opens a window for its use in lubricant's formulations at high-temperatures.

### Recent Publications

1. Li Y et al. (2013) Selected-control hydrothermal synthesis and photoresponse properties of  $\text{Bi}_2\text{S}_3$  micro/nanocrystals. *Cryst. Eng. Comm.* 15(33):6611-6616.
2. Xu X(2016) Extreme pressure synergistic mechanism of bismuth naphthenate and sulfurized isobutene additives. *Surface Review and Letters.* 24(5):1-12.
3. Heilig M and Egli M (2006) Pharmacological treatment of alcohol dependence: target symptoms and target mechanisms. *Pharmacology and therapeutics.* 111(3):855-876.
4. Li X et al. (2008) Acute alcohol intoxication potentiates neutrophil-mediated intestinal tissue damage after burn injury. *Shock* 29(3):377-383.
5. Room R, Babor T and Rehm J (2005) Alcohol and public health. *Lancet.* 365(9458):519-530.

### Biography

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