

# Synergistic Combination of Dimercapto Thiadiazole Derivatives with Organo-Moly as EP Additives in Greases

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## Abstract:

The four-ball test was employed to evaluate the extreme-pressure (EP), antiwear (AW) and friction-reducing (FR) performances of molybdenum dialkyl dithiophosphate, and 2,5-dimercapto-1,3,4-thiadiazole (DMTD) derivatives, i.e., DMTD dimer, and its complex with polyalkylene glycol (PAG), in greases. DMTD dimer and its complex with PAG exhibit excellent EP properties, which can achieve high weld load in lithium complex greases, polyurea greases and calcium sulfonate complex greases. In lithium complex grease, molybdenum dialkyl dithiophosphate possesses outstanding AW and FR performances, which results in low wear scar and low friction coefficient. In calcium sulfonate complex grease, molybdenum dialkyl dithiophosphate provides good EP properties with high last non-seizure and weld loads, and excellent FR performances. But in polyurea grease, molybdenum dialkyl dithiophosphate

does not exhibit obvious EP, AW and FR capacities. In lithium complex grease, with the combinations of molybdenum dialkyl dithiophosphate and boron ester or DMTD dimer complex with PAG, excellent EP, AW and FR performances can be achieved simultaneously. In polyurea grease, just the combination of molybdenum dialkyl dithiophosphate and DMTD dimer complex with PAG can get good EP, AW and FR results. In calcium sulfonate grease, the combination of molybdenum dialkyl dithiophosphate and DMTD dimer could achieve high weld load, low wear scar and low friction coefficient.

## Keywords:

grease, extreme pressure, glycol, polyglycol, 2,5-dimercapto-1,3,4-thiadiazole, DMTD dimer, molybdenum dithiophosphate, antiwear agents, friction reducing agent, testing.