

Hydrogen Bonding Enhanced Thermally Conductive Carbon Nano Grease

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Grease made from carbon nanotubes (CNTs) and carbon nanofibers (CNFs) have shown superior thermal conductivity. Thermal conductivity enhancements up to 545.9% over the base fluid are reported by loading 12 wt% of carbon nanofiber into NYE Blank Grease. The unexpected results in this paper also lead to an improved way to significantly enhance the thermal conductivity of greases while reducing the nanotube loading percentage. A carbon nanofiber loading of only 5 wt% leads to a 163.3% increase in thermal conductivity in NYE 758G grease. A loading of 1.4 wt% hydroxyl functionalized multi-wall nanotube (MWNT-OH) in Krytox XHT750 oil leads to a 37.8% increase in thermal conductivity. The new discovery detailed in this paper is that hydrogen bonding between nanotube and oil is the key element for a good conductivity performance. The introduction of hydrogen bonding in any form into the grease increases thermal conductivity. The grease structure is created by the sole thickeners which are carbon nanotubes and nanofibers. This makes the grease unique and valuable.