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BN nanoparticles as antiwear additive in oil lubricant

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It's matter of fact that friction causes loss of efficiency and induce wear. But modern machines and mechanical gears operating under severe conditions still require lubricants that can resist high temperatures and pressure. Enhanced lifetime of machinery and improved energetic efficiency can be achieved by development of new lubricating oil additives. Boron nitride is well-know solid lubricant with hexagonal structure that possess high temperature resistance of 1200ºC in an oxidizing atmosphere. Meanwhile an information about BN as lubricating oil additive is very limited, moreover BN nanotubes and nanospheres were synthesized only in recent years. In present work a comparative tribological investigation of different types on BN nanoparticles (nanosheets, nanospheres, nanotubes) is presented. Initially, structure of nanoparticles was studied in terms of SEM, XRD and HRTEM. All types of BN nanoparticles were added in polyalphaolefin (PAO 6) in concentrations 0.005 – 0.1 wt.% and tested using ball-on-disk tribometer. Steel plate (100Cr6) and steel ball (100Cr6) were dipped in PAO 6 doped with BN nanoparticles and tested in reciprocating motion mode for 10000 cycles. It is shown different tribological behavior according to shape of added nanoparticles. The nanosphere additive leads to increase of wear rate with increasing of particle concentration. In contrast, the nanosheets additive cause drop of wear rate from 2.5 □ 10^{-7} mm^3/N□m to (pure PAO 6) to 2.32 □ 10^{-9} mm^3/N□m (0.1 wt.%). Further SEM, HRTEM investigation of wear debris were carried out. Deformation inside TEM targeted at determining the deformation resistanceof BN nanoparticles was also performed.

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