

Nano tribology of nano particles added in engine oil and nano coatings of piston rings-cylinder liners in internal combustion engines

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Abstract

This speech is related to our old and purely new scientific work carried out in our Automotive Lab. Real piston ring/cylinder specimens were tested with reciprocating tribometer using five different nanoparticles added engine oil to investigate their wear and friction behavior. With regard to the experiments, it has been found that the best results were determined by TiO₂ and SWCNTs (SWCNTs) according to the BN (boron nitride), Multi-walled carbon nanotubes (MWCNTs) and graphene nanoparticles added to the engine oil, respectively. At the end of the tests, abrasive wear has been observed as the main wear mechanism. The tribological characteristics of piston ring against a cylinder liner in the presence of graphene nano-additives mixed into 5W/40 fully synthetic engine oil was also investigated. The tribometer and engine test results showed that graphene nanoparticles are a potentially beneficial additive to engine lubricants. Chromium Carbon Nitride coating (CrCN) is deposited with (Physical Vapor Deposition) PVD method on cylinder liner. Friction and wear test were conducted using a reciprocating tribometer. Although the CrCN coating eliminated the wear of the coated liner, the restricted tribofilm formation and the high coating hardness led to more intense wear of the piston ring and showed slightly higher friction value related non-coated liner. Diesel engine cylinder liner is also coated with Graphene using Chemical Vapour Deposition (CVD) technique on the cylinder liner surface. Graphene coating showed slightly lower friction value between ball and coated cylinder liner pairs related non-coated liner.

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