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3D digital microscopic examination of graphene coated engine cylinder liner surface

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Fuel combustion in automobile engines causes gaseous emissions, which in turn causes damage to the environment when automobile production increases. This can be solved by increasing the efficiency of the engine, and as the efficiency increases, fuel consumption is reduced. An engine cylinder liner is affected high-temperature and high-pressure gas and always cause high-speed slide friction with piston rings and piston skirt. If liner surfaces are properly configured, tribological behavior can be achieved. Functional surface treatments and coatings provide to improve the sliding properties of metal surfaces. The inner walls of the cylinder must be able to withstand higher combustion pressure and higher piston speed, so that the surface of the cylinder must be resistant to friction and abrasion. Nowadays, it is desired to obtain the most efficient surface by applying different coatings to these surfaces. A lot of different types of Nano-coatings are used for this process. Nowadays, nano coatings are preferred because they are more advantageous than conventional coatings. In this study, the diesel engine cylinder liner is coated with graphene using chemical vapour deposition (CVD) technique on the small cut-pieces of cylinder liner surface. The graphene coating was successfully deposited on cylinder liner as monolayer, by direct synthesized CVD method under vacuum conditions using hydrogen flux synthesizing with hexane vapor in new design CVD reactor. This coating rights belongs to GrafenBioTech Nanotechnology engineering Ltd. in Konya-Turkey. Friction properties of (CVD) graphene coated liner were tested experimentally in tribotest rig. The tribometer tests were carried out 100CrMn6 balls rubbing on coated and uncoated cylinder liners using 5w40 synthetic engine oil, under boundary lubrication conditions. The coated liner material is a spheroidal graphite cast iron. 2D and 3D micrographs, 2D and 3D surface roughness parameters were presented. Graphene coating showed slightly lower friction value between ball and coated cylinder liner pairs related non-coated liner. No wear exist on the ball surface while abrasive wear lines-grooves occured on the rubbed surface of non coated and coated liner (with protective layers).

Biography

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