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Surface coating of monolayer graphene on piston ring for internal combustion engines

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The study of graphene has been one of the most exciting topics in material science and many other research fields since the first report of the preparation and isolation of single graphene layers in 2004. After the experimental discovery of its unique properties in 2004, graphene has become a material of intense research with a variety of applications in electronics, photonics and sensor technologies. For most of these applications, large area monolayer and bilayer graphene films are used. The growth of graphene by Chemical Vapor Deposition (CVD) on polycrystalline copper foils has become very popular because of its scalability, high yield, low cost and suitability for industrial implementation. Typically, the copper foil is exposed to gaseous hydrocarbons at high temperatures, which are catalytically decomposed forming graphene domains on the copper surface. This study focuses on transferring synthesized graphene with Chemical Vapor Deposition system on the piston ring surface. Firstly, it is synthesized graphene with CVD method. Then, it is transferred as monolayer graphene flakes coating piston ring. Graphene layers were confirmed by green Laser at 532 nm wave length with Raman peaks such as 1581 and 1582 cm^{-1} and 2D peaks at 2700 cm^{-1} band in Raman spectroscopy. Friction properties of graphene layers were tested experimentally in tribotest rig. Graphene coating showed lower friction value between piston ring and cylinder liner and tribofilms were presented by microscopic examination. It is advisable that graphene layers can be coated by transfer method and be used in the internal combustion engines.

Biography

Emre Çıtak was born in 1991 at Izmir in Turkey. He received his B.Sc. degree in 2014 and going on the master programme in Chemical Engineering Department of Selcuk University. During master programme, he has lead to research project on the graphene and carbonnanotubes with local funding. His special research areas are graphene, carbonnanotubes and nanomaterials and their applications. Emre Çıtak is director of GrafenBiotech Nanotechnology Co. Ltd. GrafenBiotech NanoTechnology Co. Ltd. was established in 2015 as a Nanotechnology start-up in order to produce critical Nanomaterials such as Carbon Nanotubes (CNT) and Graphene and create a local market on these materials in Turkey. After the successful Production of various types of Graphene, we began to study on the applications of different Nanomaterials including nanotubes, metal oxides, carbides, clay Nanoparticles and many others in projects funded by local funding agencies.

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