Graphene-based nanolubricants could grease automotive industry?s future

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Adding nanoparticles to lubricants enhances their ability to conduct heat, lubricate and protect from wear-and-tear. Credit: Zoya Fedorova

Recent research has shown that adding nanoparticles to liquids significantly enhances some of their properties. "Nanofluids" have been synthesised using carbon nanotubes and various metallic, oxide and ceramic nanoparticles. Adding nanoparticles to lubricants enhances their ability to conduct heat, lubricate and protect from wear-and-tear. These are important properties in the automotive industry as better lubricants

result in reduced engine wear, lower noise, and better and longer engine performance.

So far, nanofluids employing carbon nanotubes have shown the best results. Now, a team of Malaysian scientists from the University of Nottingham Malaysia Campus and Taylor's University are examining the effects of adding graphene nanoflakes to various commercially available lubricants. Graphene is an incredibly strong one-atom-thick layer of carbon with excellent thermal and electrical conductivity, and properties for reducing wear and friction.

The team found that adding just 0.01% graphene nanoflakes compared to the total mass of lubricant improved its thermal conductivity by 17%, with almost no changes in viscosity. The enhancement of the lubricant's thermal properties generally varied according to the size, concentration and heating rates of the graphene nanoflakes used. The researchers believe that the enhanced thermal properties are due to graphene's large surface area, even distribution and Brownian motion – the erratic random movement of its molecules due to collisions with other molecules. Improved thermal conduction means the lubricant is better able to carry heat away from an engine.

Abdul Khaliq Rasheed of the University of Nottingham Malaysia Campus is optimistic that graphene nanolubricants could last approximately 20% longer than the currently available 5,000 and 10,000 km motor oils. They may even cost less, because adding nanoparticles could reduce the amounts of other additives currently required. They could also protect engines better than currently available lubricants because they reduce friction. The main challenge for researchers now is to develop a complete nanoparticle-based formula that measures up to industry standards, he says.

Dr Mohammad Khalid, the principal researcher of this project, believes

that the commercialization of the nanolubricants is not far away, as many companies have shown interest in developing them. In the future, he plans to investigate graphene's impact on automotive coolants and electronic cooling.

Provided by University of Nottingham Malaysia Campus

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