Novel molecules significantly reduce wear

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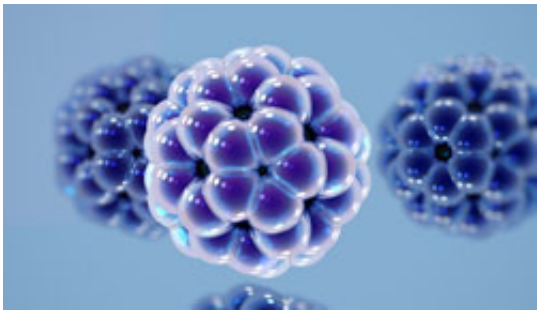

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Machines with sliding and rolling parts are virtually ubiquitous. European funding enabled researchers to develop high-performing coatings and lubricants based on a novel new class of molecules to significantly reduce wear.

Moving parts in contact with other components must be lubricated to reduce friction and wear. Over time, machine performance and efficiency are decreased with concurrent increases in maintenance time and cost, and decreases in machine or part lifetime.

Conventional industrial lubricants are typically oil-based and can cause considerable damage to the environment when not disposed of properly.

European researchers sought to develop innovative composite coatings for moving parts to reduce friction and extend operational life as well as

reduce maintenance and environmental impact. They focused on the use of inorganic fullerene-like materials (IFLMs).

Fullerenes are a class of 'hollow' molecules composed entirely of carbon and first identified in 1985. Buckyballs, the spherical variety with bonding formation resembling the pattern on a soccer ball, and buckytubes, carbon nanotubes, have received a great deal of attention since then due to their unique chemical and physical properties.

It turns out that carbon, the main component of most organic molecules, is not the only element to form fullerenes and nanotubes. Inorganic fullerene-like nanoparticles have been shown to have excellent lubricant behaviour.

With funding of the 'Fullerene-based opportunities for robust engineering: making optimised surfaces for tribology' (Foremost) project, scientists developed coatings and lubricants based on incorporation of nanoparticles composed of IFLMs.

Scientists incorporated preformed IFLMs into the deposition process, lubricant or paint and also formed the IFLMs in situ during the deposition process.

Full characterisation of chemical, structural and mechanical properties enabled elucidation of IFLM lubrication mechanisms and deeper understanding for better future design and application.

Inaddition, investigators provided important input regarding health and safety with respect to the IFLMs.

The tremendous variety of coatings and lubricants developed by Foremost significantly reduced friction in sliding tests, impressively outperforming current state-of-the-art alternatives.

They were also high performers in reducing fretting fatigue, wear induced by shear stress or vibration at contact points between two parts under heavy load. This result is of particular importance to the aerospace industry.

Foremost lubricants based on novel fullerene-type molecules have broad-sweeping application. They should help reduce maintenance costs and downtime as well as extend the operational life of a plethora of machines and components.

Provided by CORDIS