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Tertiary Dry Solid Lubricant on Steel Surfaces Reduces Significant Friction and Wear under High Load Conditions

A novel solid-state, graphene-zinc oxide composite lubricant film significantly reduces friction and wear under extreme conditions, offering greater stability than traditional oil-based lubricants for high-temperature or high-load applications.

Liquid lubricants are used for a wide spectrum of purposes in industry including such things as transferring heat, protecting against wear and corrosion, transmitting power, and reducing friction. Most liquid lubricants typically consist of 90 percent base oil such as petroleum or mineral oils. Due to oil's volatility and flammability, it is unstable for use in high temperature or low pressure applications. There is need for a new, more stable lubricant for such applications.

Researchers at Purdue University have developed a novel graphene-zinc oxide based composite film for use as a solid-state lubricant for friction and wear reduction under extreme load conditions. Using a ball-on-disk tribometer for testing, the composite film maintained its lubricating effects under extreme operating conditions. Furthermore, it reduces friction and wear between surfaces than oil-based lubricants. Because the lubricant is not oil-based, it allows for more effective utilization in high temperature or extreme low pressure applications. The durability and resilience of this adhesive coating suggest exceptional potential as a dry lubricant for high load-bearing applications.

Advantages:

-Substantial friction and wear reduction

-More stable than oil-based lubricants

-More effective in high temperature, extreme low pressure, or high load-bearing applications

-Precoated on the surface

Technology ID

2017-POL-67881

Category

Chemicals & Advanced Materials/Coatings, Adhesives & Sealants

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

Materials Science & Nanotechnology/Advanced Functional Materials

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Potential Applications:

-Machining and manufacturing

-High temperature, low pressure, or high load-bearing lubricant applications

Related Publications:

Abdullah A. Alazemi, et al. Novel tertiary dry solid lubricant on steel surfaces reduces significant friction and wear under high load conditions. Carbon, 123, October 2017, pp 7-17. https://doi.org/10.1016/j.carbon.2017.07.030

TRL: 5

Intellectual Property:

Provisional-Patent, 2017-06-22, United States | Utility Patent, 2018-06-20, United States | PCT-Patent, 2018-06-21, WO | DIV-Patent, 2020-09-24, United States

Keywords: graphene-zinc oxide, composite film, solid-state lubricant, friction reduction, wear reduction, extreme load, high temperature lubricant, low pressure lubricant, dry lubricant, adhesive coating