Study reveals that solidified lubricants do not change back to liquid form

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A new study by GW Professor Yongsheng Leng, assistant professor of engineering and applied science, and postdoctoral scientist Yajie Lei, reveals that solidified lubricants in tight pores do not change back to a liquid form. The new discovery will help in understanding and designing new lubricant to improve our fuel economy.

This study was published today by the American Physical Society (APS) and can be viewed at this link.

Stick-slip friction between solids, which produces squeaks heard in our daily lives, can also happen in lubricated contact. For example, engine oil lubricates our car engine, but if the gap in the lubricant is too tight, the lubricant will get stuck or solidified, leading to stick-slip motion and high friction.

Many physicists believe that this stick-slip friction is associated with the alternate changes in the physical property of the lubricant, for example, during the stick the lubricant changes to a solid and during the slip, the solidified lubricant changes back to a liquid.

However, this new study by molecular dynamics computer simulations shows that during the slip the solidified lubricant in very tight pore does not change back to a liquid. Instead, it simply undergoes molecular slips inside the film. Through the time variations of the frictional force and energy changes during the stick-slip cycle, this study further reveals how the friction energy is lost during the different stages of the stick and slip.

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