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Is the trend of Stribeck curves followed by nano-lubrication with molecularly thin liquid lubricant films?

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ABSTRACT

Using a lateral force microscope with our original dual-axis probe, we measured the friction of molecularly thin films of perfluoropolyether lubricants at low sliding speeds. Merging these results with those measured at high sliding speeds using a home-built pin-on-disk type friction tester, we were able to explore nano-lubrication properties over a wide sliding-speed range from 1 $\mu\text{m/s}$ to 0.2 m/s. The perfluoropolyether films displayed similar trends of an initial decrease followed by an increase in the friction coefficient as the sliding speed increases. The sliding speed at the inflection point decreased with increasing viscosity of the bulk lubricant. We conclude that the trend of Stribeck curves characterizing lubrication with bulk liquids is followed by nano-lubrication with molecularly thin liquid films.

Keywords: Nano-lubrication; Molecularly thin liquid films; Friction; Stribeck curve

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