Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Lubricating graphene with nanometer-thick perfluoropolyethers[1]
LEI LI, ANDREW KOZBIAL, STEVEN IASELLA, ALEXANDER TAYLOR, Department of Chemical and Petroleum Engineering, University of Pittsburgh, ZHITING LI, HAITAO LIU, Department of Chemistry, University of Pittsburgh — Due to its excellent optical, electrical and mechanical properties, graphene has found many important applications. Since graphene is atomic thick, the wear resistance is critical to the reliability of graphene-containing devices. In this study, both monolayer and multilayer graphene were coated with nanometer-thick perfluoropolyethers (PFPEs) and the effect of the nanolubricants on the wear and friction was investigated. The coefficient of friction (COF) was measured with a commercial nanotribometer and the wear was characterized with optically microscopy, AFM and Raman microscopy. Coated with PFPEs, monolayer graphene on silicon showed significantly decreased COF. However, the wear resistance was only slightly improved. For multilayer graphene on nickel substrate coated with PFPEs, COF also decreased significantly. Meanwhile, the wear resistance was improved substantially. The results were discussed based on the graphene-substrate adhesion and the thickenss of the graphene. The learning here potentially will lead to the methodology to improve the reliability of graphene-containing devices.

[1]We thank TTRF for financial support.

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Date submitted: 07 Nov 2012 Electronic form version 1.4