

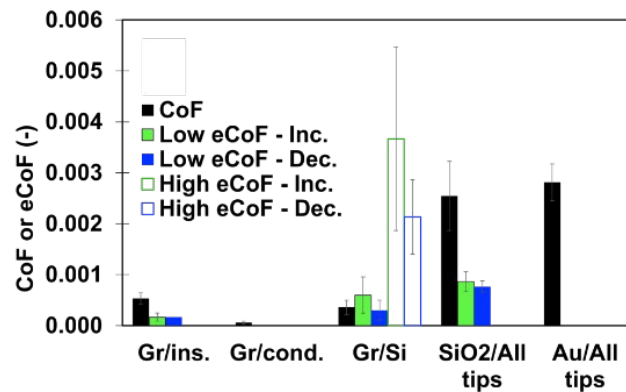
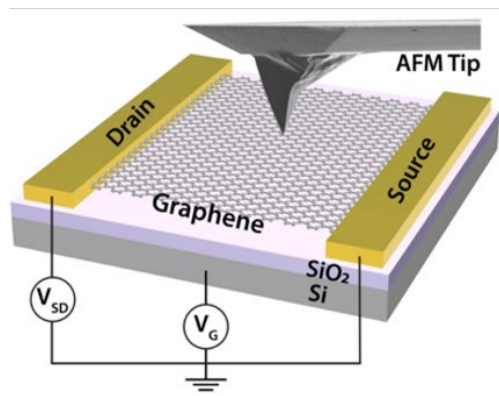


Environmental Engineering & Sciences

Department of Civil and Environmental Engineering
CEE 595AG Seminar

Friday, January 27, 2023 | 10:00 – 10:50 a.m. CST | 3310 Newmark Lab

Dynamically Tuning Friction at the Graphene Interface Using the Field Effect



As realistic engineering scales continue to become smaller and smaller, fundamental understanding and control of the interactions between surfaces, molecules, and ions is more and more important, particularly in the context of technologies like filtration and energy storage. Dynamically controlling friction in micro- and nanoscale devices is possible using applied electrical bias to a surface, but this can also induce unwanted reactions which can affect device performance. External electric fields provide a way around this limitation by removing the need to apply bias directly to a surface. 2D materials are promising candidates for this approach as their properties can be easily tuned by electric fields and they can be straightforwardly used as surface coatings. This work investigates the friction between single layer graphene and an atomic force microscope tip under the influence of external electric fields. While the primary effect in most systems is electrostatically controllable adhesion, graphene in contact with semiconducting tips exhibits a regime of unexpectedly enhanced and highly tunable friction. The origins of this phenomenon are discussed in the context of fundamental frictional dissipation mechanisms and changes in the charge carrier density in graphene.

Gus Greenwood EES PhD Student (Advisor Rosa Espinosa Marzal)

Gus is a 4th year PhD student working with Professor Rosa Espinosa-Marzal. He graduated from Loyola University Chicago with a BS in physics in 2017 before coming to UIUC and completing his Masters in Environmental Engineering, also with Prof. Espinosa-Marzal, in 2019. His research explores tailoring the surface properties of 2D materials to control surface forces and friction, particularly in aqueous environments. He also currently serves as a member of both the CEE and EES/EWES Graduate Student Advisory Committees.

