Tribology of Atomically Thin (2D) Materials

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Over the last decade two-dimensional (2D) nanostructures have emerged as a new class of advanced material due to their atomically thin geometries and extraordinary materials properties. Since the discovery of freestanding graphene just over a decade ago in 2004, it and other 2D materials such as graphene oxide, boron nitride, and molybdenum disulfide (MoS_2) have been proposed for use in wide ranging applications from high speed electronics; to water filtration; to bulletproof vests. In some cases their discovery has also promoted renewed interest, and provided new fundamental insights, into their associated 3D material systems (e.g. graphite, MoS_2 coatings) which have been successfully used in applications for decades. Given the layered nature of 2D materials, understanding and tailoring the tribology of their surfaces and interfaces is of particular importance for successful implementation in applications such as papers/membranes, protective coatings, high tenacity fibers, and lightweight composites. This talk will explore important advances in the field of tribology of 2D materials over the last decade. The discussion will include an outline of nanoscale tribology methodologies used to study 2D materials, size-scale tribological phenomena exhibited by 2D materials, and several specific examples of how tribology can play a critical role in 2D material applications.