Abstract Submitted
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Observation of tribo-induced melting of an asperity contact with STM-QCM[1] JACQUELINE KRIM, SANG-MIN LEE, DOUG L. IRVING, CLIFF W. PADGETT, DON W. BRENNER, North Carolina State University — Heating, energy dissipation and melting at the interface of a nanoscale sliding contact can trigger a broad range of interfacial physical and chemical processes. A fundamental understanding of these processes is largely lacking, however, because they occur at buried interfaces that are extremely difficult to characterize during sliding. In the arena of nanotechnology, heating, energy dissipation and conversion issues are integral to successful device design, construction and operation. Particularly compelling is the fact that any frictional heat produced is available to destroy device function: If any portion melts, the nanoscale device itself is destroyed. We report here on our use of the unique capabilities resulting from combining a scanning tunneling microscope (STM) and a Quartz Crystal Microbalance (QCM) to characterize the melting of a buried sliding interface between a tungsten tip and an indium overlayer. An analytic heat transport model supports the conclusion of melting arising from tip-surface sliding. These combined results constitute the first compelling evidence for the observation of tribo-induced melting of an asperity contact.

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