Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Tuning friction with an external magnetic field: A Quartz Crystal Microbalance study of physisorbed oxygen monolayers and multilayers sliding on nickel substrates.[1] Z.B. FREDRICKS, K.M. STEVENS, B. ACHARYA, J. KRIM, North Carolina State University — The sliding friction levels of oxygen monolayer and multilayer films adsorbed on nickel close to the oxygen monolayer solid-liquid melting transition temperature have been monitored by means of a Quartz Crystal Microbalance (QCM) technique in the presence and absence of a weak external magnetic field. Friction levels for the monolayers in the presence of the field were observed to be half of those observed in the absence of a field. For thick films, the reduction was proportionately less, indicating an interfacial effect as the source of the magnetic sensitivity. While the presence of the field is expected to increase the normal force between the paramagnetic oxygen overlayer and the ferromagnetic substrate, the impact of this mechanism on friction appears to be minimal, or possibly masked by more dominant mechanisms. These include magnetically induced structural reorientation (magnetostriction), and/or realignment of adlayer spins in response to the applied field, both of which would reduce the physical or magnetic interfacial commensurability, thus lowering friction levels.

[1]Work supported by NSF DMR1310456

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Date submitted: 06 Nov 2015 Electronic form version 1.4