Abstract submitted to the Gordon Research Conference Thin film & small scale behavior,
July 27 - August 1, 2008, Colby College, Waterville, ME, USA

# On the Nanotribology of Transition Metal Dichalclgenides Deposited by Various Sputtering Techniques.

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**Abstract**

Components of micro electro-mechanical systems (MEMS) have very high surface to volume ratio. Forces applied to such systems are quite low making surface forces to play a dominant role. However, as the sizes of such systems are quite small, the contact pressure is estimated to be few hundred MPa. Such forces cause undesirable effects such as stiction and high friction leading to reduction of operational reliability. The main objective of the work is to enhance the performances of MEMS by applying self-lubricating films on the surfaces, which are sliding against each other. In order to achieve the above mentioned objective, transition metal dichalcogenides (TMD) are deposited on steel substrates employing magnetron sputter deposition. Metal containing TMD is also deposited on similar substrates. The mechanical properties of these films are determined using nanoindentation and cantilever laser beam stress measurements. These films are characterized with the help of transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), X-ray diffractometry (XRD), and Raman spectroscopy. The nanotribological properties of these films are examined by an atomic force microscope (AFM) equipped with a nanoindenter and a nanoscratch tester. The friction force surfaces, topography induced friction surfaces and adhesion induced friction surfaces are obtained under various conditions. The mechanisms of friction dissipation are also examined.