Corrugated Two-dimensional Material Enabled Flexoelectricity for Cryogenic Actuator Technology

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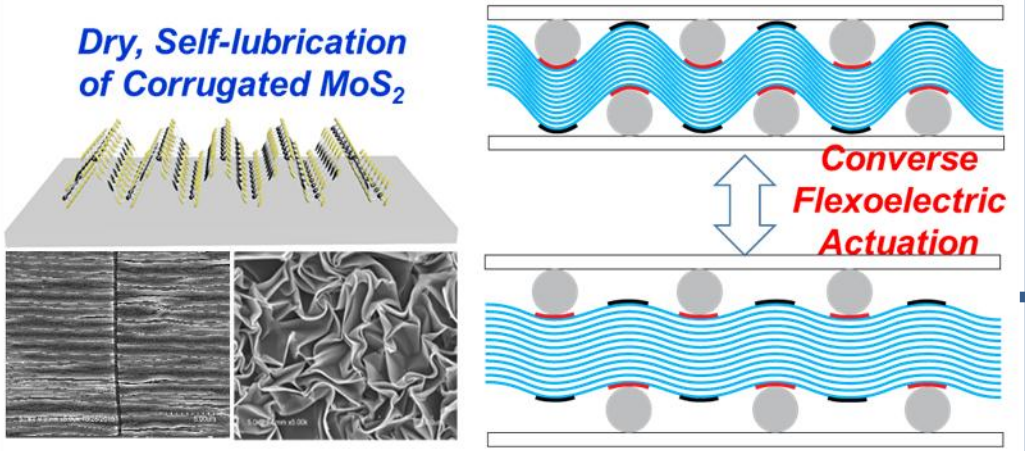
Research Objectives

- **Converse flexoelectric effect** based on corrugated MoS_2 thinfilm to enable self-lubricating, high stroke actuation capability under cryogenic and vacuum conditions
- TRL1 (start): Fundamental understanding of flexoelectric cryogenic actuator technology (FCAT)
- TRL3 (end): Characterization & evaluation of FCAT in simulated settings at NASA



FCAT based on corrugated MoS_2 thinfilm. (*left*) Corrugated MoS_2 enabled dry, self-lubrication. (*right*) FCAT actuation mechanism.

Approach

- Fundamental piezoelectric force microscopy (PFM) study of converse flexoelectricity of corrugated MoS_2 thinfilms
- Development of corrugated MoS_2-based FCAT for linear actuation
- Modular assembled FCAT with customizable stroke using stochastically assembled corrugated MoS_2

Potential Impact

- Support NASA's mission on future robotic science and deep space human exploration needs based on radical improvements in performance and reliability of FCAT platform
- Infusion of FCAT technology into NASA
- Demonstration of converse flexoelectric actuation based on emerging material system