# Wednesday Evening, December 11, 2024

## Thin Films and Surface Modification

## Room Naupaka Salon 4 - Session TF1-WeE

### Thin Films - Properties

**Moderator: Tetsuhide Shimizu**, Tokyo Metropolitan University

5:40pm **TF1-WeE-1 Superlubricity: Toward Design of Zero-Friction and Zero-Wear Materials***, Diana Berman,* University of North Texas **INVITED**

Friction and wear-related failures remain the greatest problems in today's moving mechanical components, from microelectromechanical devices to automotive assemblies and to biological systems. The critical need to reduce and eliminate the tribological failures constitutes the necessity for continuous search of novel materials and lubrication solutions. In this presentation, we overview recent advances in establishing the fundamental understanding of materials interactions at sliding interfaces and use this knowledge as a guide to developing nanomaterials solutions that enhance reliability and efficiency of tribological systems. We evaluate tribological performance of 2D materials, including graphene, molybdenum disulfide, and MXene, and demonstrate realization of superlubricity regime at macroscale. To extend the lifetime of the tribological materials, we demonstrate tribochemically-driven self-replenishment of materials inside the contact interfaces, thus enabling a zero-wear sliding regime.

Overall, the findings have not only allowed us to solve some long-standing puzzles, but could also open a new avenue for the development of new concepts and design strategies for next generation of tribologically efficient materials systems.

6:20pm **TF1-WeE-3 Langmuir Monolayer Studies of First-Generation Photoswitchable DASA Surfactants***, Harpreet Kaur,* University of Saskatchewan, Canada*; Sheena Sumat, Scott Murphy,* University of Regina, Canada*; **Matthew Paige**,* University of Saskatchewan, Canada

Donor-Acceptor Stenhouse Adducts (DASAs) are photochromic molecules that can be isomerized with visible light between a coloured, linear triene form to a colourless cyclic form.These compounds have garnered considerable interest for a variety of light-based applications in the field of photopharmacology and related fields.In this work, we have synthesized several first-generation DASAs with a barbituric acid-based acceptor and a dialkyl amine donor, and investigated how the chemical structure of the DASA affects fundamental structural properties of Langmuir films they form.The DASAs form stable monolayer films at the air-water interface and exhibit a classical LE-LC phase transition at room temperature.Photoillumination leads to a significant alteration in film packing, along with spectroscopic changes consistent with successful isomerization between triene and cyclic form.Film morphology at the air-water interface is also significantly impacted by the photoisomerization process, as assessed by *in situ* Brewster Angle Microscopy.We have also explored the ability to deposit films as both monolayers and multilayers onto solid substrates and characterized the deposition process efficiency and resulting film structures using a variety of techniques.Time allowing, the structure and orientation of the DASA headgroup at the air-water interface will be discussed in context of appropriate molecular modeling calculations.

# Author Index

## Bold page numbers indicate presenter