SEMINAR SERIES

Supported by The Department of Biomechanics and
The Center for Research in Human Movement Variability (MOVCENTR)

Stretchable Surfaces for the Rational Manipulation of Microdroplets

Featuring Dr. Stephen Morin

University of Nebraska - Lincoln

Friday, April 1 | 12:00 - 1:15 pm | Zoom

https://unomaha.zoom.us/s/92012305734

PRESENTATION ABSTRACT

We are investigating new synthetic strategies for the fabrication of adaptive, hybrid structures comprised of combinations of soft materials with functional (chemical, optical, mechanical, etc.) properties. Central to these efforts are elastomeric surfaces with heterogeneous chemical and physical properties that can be reversibly reconfigured using simple, macro-scale processes such as mechanical deformations. In this talk I will focus on our recent efforts in the micromanipulation and transport of microdroplets using these "stretchable chemical patterns."

Spatial variations in the wettability of surface-chemical gradients has long been used to transport liquid droplets along predefined paths at predictable velocities. In these demonstrations the chemical gradients were synthesized, almost exclusively, on rigid, planar substrates which limit their adaptability. We have pioneered a set of techniques which enable the facile synthesis of large-area surface-chemical gradients on soft elastomers (e.g., PDMS) with mechanically switchable surface microtopography. These advances enabled the fabrication of, for the first time, mechano-adaptive soft surfaces capable of controlling the transport of liquid droplets dynamically. We provide an empirical model which predicts the onset of droplet transport based on critical parameters such as strain state, microtopography, and droplet radius. Further, we demonstrate the use of these mechano-adaptive gradients in functions relevant to surface-fluidic applications and self-cleaning surfaces. We believe these findings are generally applicable to the generation of mechanoadaptive materials with dynamic, programmable surface-liquid interactions and chemical reactivity and directly useful to, for example, the design and fabrication of surface-fluidic devices, adaptive coatings, and smart textiles.

ABOUT DR. MORIN

Stephen A. Morin is an Associate Professor, with tenure, in the Department of Chemistry at The University of Nebraska – Lincoln. His research interest include: materials chemistry, nano-/microscale assembly, nanomaterials synthesis and characterization, adaptive materials, soft robotics, hybrid materials systems, and bottom-up fabrication. Stephen completed his B.S in Chemistry at The University of Texas at Austin in 2004. He received his Ph.D. in Chemistry in 2011 from the University of Wisconsin - Madison. From 2011 until 2013, Stephen was a postdoctoral fellow in the lab of Professor George M. Whitesides in the Department of Chemistry and Chemical Biology at Harvard University. Stephen joined the faculty in the Department of Chemistry at UNL in Fall of 2013 and received tenure in Fall of 2019. He was awarded a 3M Non-tenured Faculty Award in 2015 and an NSF CAREER Award in 2016. He has published over 50 peer reviewed publications with over 4,500 citations.

more info at **cobre.unomaha.edu**

*This seminar was supported by the National Institutes of General Medical Sciences of the National Institutes of Health under Award Number P20GM109090 Center for Research in Human Movement Variability. |

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