

# MRSEC SEMINAR SERIES

## Building a Manufacturing Ecosystem for Flexible Hybrid Electronics: a Focus on Aerospace Opportunities

As advanced electronics proliferate in both the commercial and defense sectors, they continue to be largely limited to rigid form factors with bulky packaging dictated by traditional manufacturing processes and fragile components. Yet for applications ranging from wireless, low-profile medical devices to smart food labels to aircraft with embedded stress sensors, there's a need for high-performance electronics that conform to the shape of our bodies, vehicles, and consumer goods. Flexible Hybrid Electronics (FHE), which combine additive manufacturing processes with flexible or unpackaged silicon ICs, will enable these capabilities.

The Air Force Research Laboratory (AFRL) is working to deliver these technologies through both in-house research as well as advanced development and demonstration programs with industry and universities. The presentation will highlight AFRL research including printed silicone cellular structures with embedded electronics, high performance flexible gallium nitride devices, and printed lithium ion batteries. The presentation will also describe AFRL advanced development programs including conformal antennas for unmanned aircraft, wearable hydration monitors based on bio-impedance and electrolyte concentration in sweat, and a wearable monitoring system for workers in confined spaces. For both in-house research and advanced development efforts, AFRL needs and collaboration opportunities will be discussed.

Recognizing the need to develop new manufacturing processes in the United States in order to enable these applications for both the commercial and defense markets, the Department of Defense established NextFlex, America's Flexible Hybrid Electronics Manufacturing Institute in 2015. Based in San Jose, CA, NextFlex is a \$170M public-private partnership that is building a domestic FHE manufacturing ecosystem by developing manufacturing processes and tools with its member companies and universities, standing up an FHE manufacturing pilot line in Silicon Valley, and establishing education and workforce development programs to train tomorrow's workforce. The second half of the presentation will describe the structure and goals of the Institute as well as how to engage with NextFlex in contributing to manufacturing roadmaps and NextFlex-funded projects in areas such as device integration & packaging, modeling & design tools, and printed flexible components.



**Benjamin J. Leever, Ph.D.**

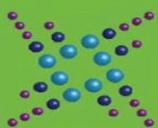
**Advanced Development Lead, Soft Matter Materials**

***Air Force Research Lab***

**Thursday, January 18<sup>th</sup>, 2018**

**Ryan Hall, Room 4003**

**4:00 p.m. – 5:00 p.m.**



Northwestern University Materials Research Center  
mrc@northwestern.edu - 847.491.3606

