Flexible Technologies for Self-Powered Wearable Health and Environmental Sensing

Veena Misra, Alper Bozkurt, Benton Calhoun, Thomas Jackson,
Jesse S. Jur, John Lach, Bongmook Lee, John Muth,
Ömer Oralkan, Mehmet Öztürk, Susan Trolier-McKinstry, Daryoosh Vashaee,
David Wentzloff, and Yong Zhu

This article provides the latest advances from the NSF Advanced Self-powered Systems of Integrated sensors and Technologies (ASSIST) center. The work in the center addresses the key challenges in wearable health and environmental systems by exploring technologies that enable ultra-long battery
lifetime, user comfort and wearability, robust medically validated sensor data with value added from multimodal sensing, and access to open architecture data streams. The vison of the ASSIST center is to use nanotechnology to build miniature, selfpowered, wearable, and wireless sensing devices that can enable monitoring of personal health and personal environmental exposure and enable correlation of multimodal sensors. These devices can empower patients and doctors to transition from managing illness to managing wellness and create a paradigm shift in improving healthcare outcomes. This article presents the latest advances in high-efficiency nanostructured energy harvesters and storage capacitors, new sensing modalities that consume less power, low power computation, and communication strategies, and novel flexible materials that provide form, function, and comfort. These technologies span a spatial
scale ranging from underlying materials at the nanoscale to body worn structures, and the challenge is to integrate them into a unified device designed to revolutionize wearable health applications.