

# Tuesday Evening Poster Sessions, October 22, 2019

## **MEMS and NEMS Group**

### **Room Union Station AB - Session MN-TuP**

#### **MEMS and NEMS Poster Session**

**MN-TuP-1 Multimodal & Multifunctional Soft Sensors for Electronic Textiles**, *Ashish Kapoor, T Ghosh, A Bozkurt*, North Carolina State University

Soft polymer-based sensors as an integral part of textile structures have attracted considerable scientific and commercial interest recently because of their potential use in healthcare, security systems, and other areas. While electronic sensing functionalities can be incorporated into textiles at one or more of the hierarchical levels of molecules, fibers, yarns, or fabrics, arguably a more practical and inconspicuous means to introduce the desired electrical characteristics is at the fiber level, using processes that are compatible to textiles. In this research, a prototype multimodal and multifunctional sensor array formed within a woven fabric structure using bicomponent fibers with ordered insulating and conducting segments is reported. The conducting segments are extruded from a percolating conducting composite made by dispersing carbon fillers in an elastomer. The multifunctional characteristics of the sensors are successfully demonstrated by measuring tactile, tensile, and shear deformations, as well as wetness and biopotential (heart rate). While the unobtrusive integration of sensing capabilities offer possibilities to preserve all desirable textile qualities, this approach demonstrates the potential for scalable and facile manufacturability of practical e-textile products. The capability of these fiber-based sensors is further being explored for objective monitoring of the inner socket environment (i.e. pressure, temperature, and humidity) and residual muscle activity during daily prosthesis use in lower limb amputees.

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