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Controlled Deposition of SWNTs for Fabrication of Flexible Structural Health Monitoring Strain Sensors PHILLIP WILLIAMS, BUZZ WINCHESKI, NASA Langley Research Center, DAVID BROWNE, Lehigh University — Single-wall carbon nanotubes (SWNTs) are currently investigated for a host of aerospace applications due to their remarkable strength-to-weight ratio and electromagnetic properties. Based on the predicted strength-to-weight advantages and inherent multifunctionality, single-wall carbon nanotube (SWNT)-based materials represent an ideal candidate for the construction of sensors capable of measuring several parameters related to an aerospace vehicle's structural health (e.g., strain, pressure, temperature, etc.), i.e. structural health monitors (SHMs). Specifically, individual SWNTs can exhibit electrical conductivity changes due to strain. Here we report on progress in utilizing this phenomenon to produce SWNT strain-sensing SHMs. Prototype device geometries are fabricated via lithographic techniques to pattern contact electrodes on substrates and controlled depositions of SWNTs between the electrodes using electric fields via dielectrophoresis. After deposition, conductivity measurements and scanning electron and probe microscopy characterize the degree of SWNT alignment and the physical and electrical properties of the devices. Optimization of the carbon nanotube deposition parameters and transfer of the patterned SWNT devices to flexible, polymer-based substrates are discussed as a basis for flexible, SHM strain sensors.

Phillip Williams
NASA Langley Research Center

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