Multiscale Design and Manufacturing of Hybrid DWCNT-Polymer Fibers

Lead PI: Dr. Horacio Espinosa **Lead PI website: http://clifton.mech.northwestern.edu/~espinosa/**

Objective

- Develop a model system for predicting the molecular properties required for new, high-strength fibers
- Prepare novel high-strength fibers composed of double-walled carbon nanotubes (DWCNTs) and polymers

Approach

- Use computer simulations to explore and understand the properties of DWCNTs (*e.g.*, bond strength, elasticity)
- Use simulation results to predict reaction ingredients needed to produce fibers of optimum strength
- Design chemical deposition techniques to produce DWCNTs with optimal properties

Technical Success

- Recently-launched MURI team already developed preliminary model of DWCNT behavior to predict molecular properties of high-strength fibers

Production equipment used for manufacture of DWCNT components

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Application

- MURI team will characterize DWCNT-polymer fibers with ARL-WMRD
  - will stimulate effective communication of research results with ARL and providing a new capability in area of fiber characterization
- DWCNT-polymer fibers will be characterized using powerful atomic force microcopy (AFM)/confocal Raman system, housed at ARL-WMRD

Potential Payoff

- New types of flexible, light-weight ballistic protection for the Soldier
- AFM/Raman instrumentation will be housed at ARL-WMRD, allowing future use of this instrument by ARL for fiber research