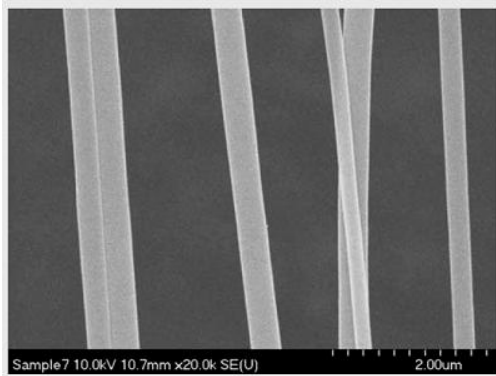


Manufacturing of Polymer Composites with Aligned Nanofibers

Faculty: Ioannis Chasiotis



Electrospun nanofibers to be embedded in a polymer matrix.

Nanocomposites are a relatively new category of materials that incorporate nanoscale components, such as nanofibers and nanoparticles. Of all nanoscale reinforcements studied to date, nanofibers and nanotubes have been the most successful due to their large aspect ratio that allows for improved bonding to a polymer matrix.

The objective of this undergraduate summer research project is to embed different nanofibers into common aerospace grade polymers in order to improve their mechanical properties, and specifically, their fracture toughness. The nanofibers will be fabricated by a home-built electrospinning apparatus that was constructed at our laboratory under an undergraduate research program in the summer of 2007. Electrospinning is a method for fabricating polymeric nanofibers in a continuous form with diameters ranging from a few tens of nanometers to a few microns. The figure shows relatively aligned nanofibers fabricated by our electrospinning apparatus. In this method, nanofibers can be fabricated in large quantities, at a small cost and with the capability to tune their composition and properties. Such nanoscale building block materials can be then embedded in advanced composites for aerospace and other applications.

This undergraduate summer research project includes the following tasks:

- 1) Fabrication of aligned nanofibers of maximum length by existing electrospinning apparatus.
- 2) Embedment of nanofibers in epoxy matrix and identification of optimum curing conditions
- 3) Design and fabrication of composite specimens for fracture experiments
- 4) Testing of nanocomposite specimens with an in-house mechanical testing system

The student should have basic knowledge of engineering design and materials and become adept to sensitive laboratory equipment. Prior experience in laboratory research or an experimental course will be criteria for selection. The student will interact closely with Salman Ashad, graduate research assistant, and with Prof. Chasiotis.

The minimum duration of this project is 8 weeks.

Point of contact: Prof. I. Chasiotis (chasioti@illinois.edu)