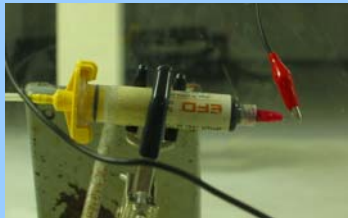
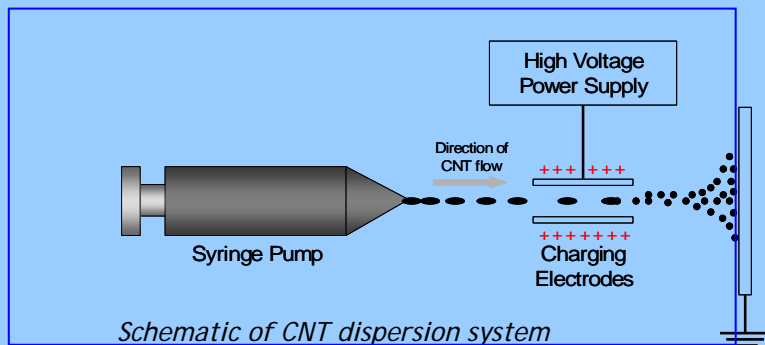


Synopsis:

Dispersion and Alignment of Carbon Nanotubes Using Electric Fields



Syringe pump



Schematic of CNT dispersion system

Background

Carbon nanotubes (CNTs) tend to aggregate due to intermolecular van der Waals forces, which make it difficult to disperse them in polymer matrices and align them in preferred orientations. Currently available solution-based CNT dispersion methods are limited by small production volumes and are not environmentally benign; therefore, they are not suitable for scale-up production. It has been demonstrated that subjecting CNTs to high electric field enhances dispersion and allows some level of alignment. However, the mechanisms by which the CNTs respond to electric field are not well understood, thus making the implementation difficult.

Goals

- Understand the mechanics of intermolecular forces that bind the CNTs into a form of aggregates
- Design and construct CNT dispersion and alignment apparatus
- Apply the developed apparatus to composite fabrication

Projects/Research Highlights

- Identification of mechanics of inter-tube forces in CNTs
- Determination of the relationship between applied voltage and charges
- CNT dispersion and alignment apparatus
- Demonstration of enhanced (mechanical, electrical, thermal, and optical) properties and morphology as a result of improved CNT dispersion and alignment, as compared to neat polymers

Benefits to Industry

- Efficient, cost-effective, environmentally benign CNT dispersion and alignment technologies
- Versatile and scale-up CNT dispersion and alignment methods for nanomanipulation, nanopatterning, and nanocomposite fabrication (with no limitations on polymer system selection)