

# ELECTROSPINNING

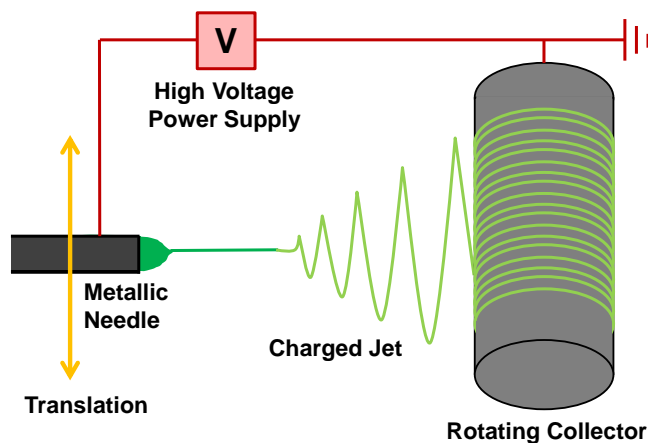


NEI Corporation has developed the capability to produce multi-scale, multi-functional, nanoscale and micron-sized fibers. We can incorporate nanoparticles into electrospun fibers, produce core-sheath fibers, and fabricate composites of electrospun fibers embedded in polymer matrix composites.

## EXPLORATORY PROTOTYPING

Whether your vision is polymer, ceramic, or metal fibers – single core or multi-core – NEI has the right tools and expertise to help you realize your ideas into the next great innovation. The world of advanced nanometer-scale fibers is rapidly expanding as new breakthroughs are made each day. We can help you transfer these breakthroughs into working prototypes by providing the appropriate environment and equipment to produce electrospun fibers.

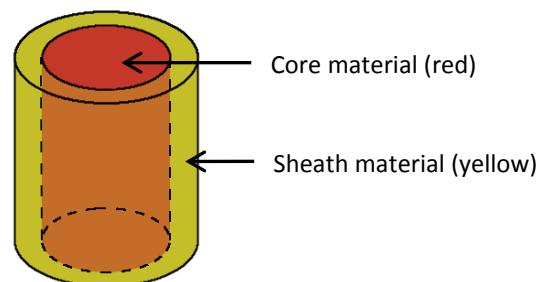
## ELECTROSPINNING NANOFIBERS



*Schematic of fibers being formed during electrospinning, due to the voltage potential between the metallic needle (where the solution [green] draws out) and the grounded collector*

## CORE-SHEATH FIBER SPINNING

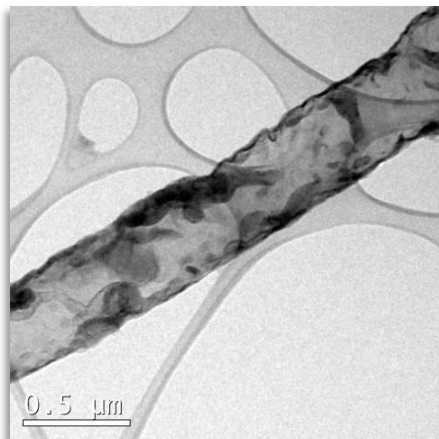
Should your application include biomimetics, microfluidics, or a host of other novel technologies, NEI will work with you in developing the next state-of-the-art, multi-core fibers. Typically, there is a specified core material and a different sheath material. Such a system can be envisioned as a drinking straw where the tube of the straw is a material, such as a polymer or ceramic, that contains another material in the core (even liquids).



*Core-sheath fibers are used to combine properties of different materials, such as adding strength or providing encapsulation for a weaker core material*

## NANOFIBER ANALYSIS

We have an array of equipment to characterize nanofibers in a variety of conditions, such as individual fibers, matted fibers, fiber threads, or fibers embedded in a composite. Analysis may include microstructure, electrical conductivity, and mechanical properties.



*Transmission Electron Microscopy of a core-sheath fiber with carbon nanotubes (CNTs) located in the sheath. The dark contrast is due to CNTs.*

## TESTING & CHARACTERIZATION

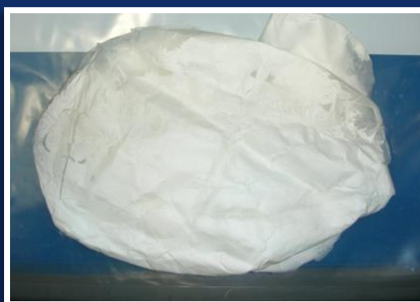
NEI offers comprehensive materials characterization and analysis services, which can be utilized to identify the properties of your electrospun fibers. As a leading developer and manufacturer of nanotechnology-based materials, we are able to lend our vast experience and knowledge to our customers in analyzing and helping attain their goals. Our expertise and state-of-the-art equipment enable us to satisfy all of your testing needs with excellent precision and in a timely manner.

A sample of our services includes:

- Optical Microscopy
- Transmission (UV-IR)
- Microstructure (SEM, TEM)
- Hydrophobicity (contact angle)
- Electrical Conductivity
- Thermal Analysis (DSC, TGA)
- Mechanical Strength (Tensile, Flexural)

## ELECTROSPINNING SERVICES

NEI can provide customized electrospinning solutions for specific applications. We partner with our customers to create a solution that meets their requirements. We work with our customers from initial R&D all the way through large scale manufacturing.



*Electrospun fibers can be made in a variety of forms. These include fibers collected as a thread onto a spool (left), a thick mat of fibers (middle), or a fiber-reinforced composite containing the nanofibers (right).*



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