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Electrospinning Composite Nanofibers of Cellulose

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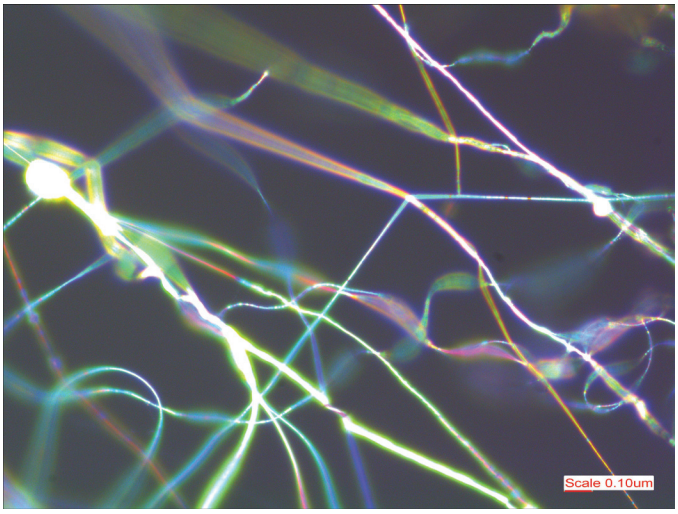
Cellulose is a biodegradable, renewable resource with useful mechanical properties in its fiber form. It can contribute to strength in composite materials. Electrospinning is a method of spinning nanoscale fibers via an electrical field. A dispersion of cellulose nanofibril (CNF) with polyethylene oxide (PEO) dissolved in water was used to obtain composite nanofibers. PEO acts as a spinning aid to obtain the correct viscosity and jet cohesion as CNF fails to spin by itself. Ideal values for parameters like target-source distance, voltage, flow rate, and concentration of PEO solution were determined to be 15 cm, 22–25kV, 1–3ml/min, and 5 weight percentage (w%). The objective is to maximize the w% of CNF in the fibers to result in high modulus and strength. Solutions of varying w% CNF were electrospun in order to find the optimal CNF:PEO ratios that enable fiber diameter control. CNF/PEO solutions successfully spun fibers for the % CNF range 2.34–6.72. The fibers that are obtained will be tested for mechanical properties and other characteristics. The interesting properties of cellulose combined with its availability and biodegradability may cause cellulose-derived materials to be the focal point of research in the future.

Research advisor Jeffrey Youngblood says: "CNFs have the simultaneous ability to lower the environmental costs of composite systems while improving properties. This study may enable better use of CNFs by developing higher-content CNF composites."



A picture of the electrospun nanofiber. The solution used has 2.99% CNF in the solute. Magnification 50x.

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