

## A Modern Industrial Revolution

“Textiles were the first industry to benefit from the discoveries of the Industrial Revolution, back in the early 1800s,” explains Juan Hinestroza, associate professor of fiber science and director of the Textiles Nanotechnology Laboratory at Cornell University. “Nanotechnology is the ‘new’ Industrial Revolution, which started in the early 2000s, and can change the items we manufacture in more sustainable ways by controlling matter, one atom at a time.”

### The Lab Team

Cornell’s work in nanomaterials began about 12 years ago. The goal was to merge the ability of nanoscale science to control materials through textile technology and create unique functions on textiles without sacrificing comfort or adding weight.

Hinestroza’s lab team consists of 11 graduate students, visiting scholars, postdoctoral fellows, undergraduate students and technicians. Hinestroza states, “Most of my team members have specific projects on which they work, but they are continuously aware of the projects of their fellow team members, so we help each other and provide unique insights into the problems we all face.”

### The Focus of the Project

The team is particularly interested in forcing cotton to do things that usually cotton does not do. Hinestroza cited as examples: “Creating cotton that can exhibit color without the need for colorants or dyes, cotton that conducts electricity, cotton that kills bacteria, cotton that can trap dangerous gases, and cotton that can decompose pollutants.”

While this is a challenging objective, Hinestroza says, “Chemistry provides massive rewards for the work we do in our lab, which are scalable and reproducible in many places throughout the world.”



**Magnified: Textured Nanofiber with nanochannels and incrusted silver nanoparticles.**

### The Testing

All the manufacturing procedures used by Cornell are designed to be easily incorporated into existing textile facilities, with minor or no changes to the manufacturing infrastructure. According to Hinestroza, his researchers traditionally use self-assembly or convected assembly mechanisms to force the nanoparticles or nanolayers in certain patterns or structure to create the unique functions.

Cornell uses traditional testing procedures currently being used in the textile industry. Hinestroza noted, “Since we are dealing with materials that are 99.99995 percent cotton, we don’t need to implement new testing methodologies. The 0.00005 percent remaining is the nanocoatings, nanoparticles, nanolayers that we deposit, and those are tested using electron microscopy techniques. We also have developed new techniques, based on scanning probe microscopy to assess the effect of these nanomaterials in improving the behavior of the coated fibers for lubrication, friction, and electrostatic behavior. This is really important, because if we can improve the measure of wear by a lubricant, there is significant gains in manufacturing productivity.”

### The Goals and Niche Markets

The Nanotechnology researchers short term goals involve continuing the exploration for new ways to add functionality without affecting comfort or adding weight, while developing and discovering several platforms to achieve this goal. Over the long term, Cornell hopes to create a universal platform to create any function with the minimal amount of material possible.

Regarding potential niche markets, Hinestroza says, “We are a university-based laboratory, so the final application is not as important to us as the understanding the underlying mechanisms behind the phenomena. We have seen that if we develop the science

without thinking about a specific application, we can generate unique knowledge that will find many applications. We love discovery of new science, and also enjoy the many applications that can appear, once fundamental scientific issues are solved.” ●

*For more information on Cornell’s Nanotechnology Laboratory, contact Juan Hinestroza at 607-255-7600 or [jh433@cornell.edu](mailto:jh433@cornell.edu)*

*Kathlyn Swantko, president of the FabricLink Network, created TheTechnicalCenter.com for industry networking and marketing of specialty textiles, and FabricLink.com for consumer education involving everything fabric.*

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