Cotton is the fabric of your lights... your iPod... your MP3 player... your cell phone

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Consider this T-shirt: It can monitor your heart rate and breathing, analyze your sweat and even cool you off on a hot summer's day. What about a pillow that monitors your brain waves, or a solar-powered dress that can charge your ipod or MP4 player? This is not science fiction - this is cotton in 2010.

Now, the laboratory of Juan Hinestroza, assistant professor of Fiber Science and Apparel Design, has developed cotton threads that can conduct electric current as well as a metal wire can, yet remain light and comfortable enough to give a whole new meaning to multi-use garments. This technology works so well that simple knots in such specially treated thread can complete a circuit - and solar-powered dress with this technology literally woven into its fabric will be featured at the annual Cornell Design League Fashion Show on Saturday, March 13 at Cornell University's Barton Hall.

Using multidisciplinary nanotechnology developed at Cornell in collaboration with the universities at Bologna and Cagliari, Italy, Hinestroza and his colleagues developed a technique to permanently coat cotton fibers with electrically conductive nanoparticles. "We can definitively have sections of a traditional cotton fabric becoming conductive, hence a great myriad of applications can be achieved," Hinestroza said.

"The technology developed by us and our collaborators allows cotton to remain flexible, light and comfortable while being electronically

conductive," Hinestroza said. "Previous technologies have achieved conductivity but the resulting fiber becomes rigid and heavy. Our new techniques make our yarns friendly to further processing such as weaving, sewing and knitting."

This technology is beyond the theory stage. Hinestroza's student, Abbey Liebman, was inspired by the technology enough to design a dress that actually uses flexible solar cells to power small electronics from a USB charger located in the waist. The charger can power a smartphone or an MP3 player.

"Instead of conventional wires, we are using our conductive cotton to transmit the electricity -- so our conductive yarns become part of the dress," Hinestroza said. "Cotton used to be called the 'fabric of our lives' but based on these results, we can now call it 'The fabric of our lights.'"

Provided by Cornell University

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