

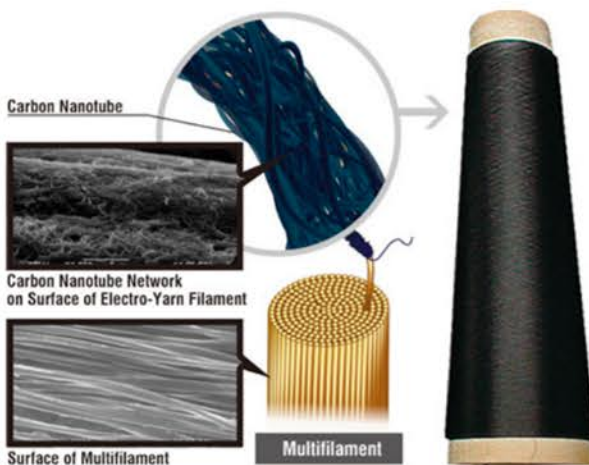
# Super High-Tech Thread

**T**he progression of smart textiles and wearable technology is being driven by the convergence of innovative apparel design, fabric science, embedded sensors, battery technology, and high performance textile research and a good example of this trend is the research happening at Hokkaido University located in Sapporo, Japan.

The program has resulted in the creation of a unique and viable carbon nanotube coating process, which was used to develop “Electro-Yarn,” a polyester multifilament, multi-walled carbon nanotube (MWCNT). Marubeni America Corporation is now marketing the unique “Electro-Yarn” as the world’s first commercially conductive thread.

Under the direction of Hokkaido University Professor Bunshi Fugetsu, the research team developed a carbon nanotube (CNT) dispersed liquid. “Initially, the team injected the CNT dispersed liquid into the thread,” explains Yuji Yasuda, business development manager for Marubeni America. “However, due to the chemical characteristic of CNT, the structural integrity of the CNT injected thread was compromised. So, a request was made from Hokkaido University to involve Mr. Masaaki Hachiya of the Chakyu Dyeing Co., to see if the CNT dispersed liquid could be coated onto the thread.”

Believing in the future potential of the CNT thread, Mr. Hachiya tested a variety of processes. Initially, the conventional method for coating the polyester thread failed to achieve the basic conductive performance that was required. But, Mr. Hachiya’s continued testing a variety of processes, which eventually led to the commercially viable coating process.



This graphic shows the development process of “Electro-Yarn.”

Today, Mr. Hachiya is known as the inventor of “Electro-Yarn.”

“While details on the unique coating technology is proprietary,” Yasuda says, “the coating material compound consists of a CNT dispersed liquid and a binder material, which is highly viscous. This unusual coating technique enabled ‘Electro-Yarn’ to be honored as the Japanese Government’s Grand Prize winner of the prestigious Innovative Manufacturing Award.”

### The Advantages of “Electro-Yarn”

The major advantage of “Electro-Yarn” is its electrical properties, combined with the flexibility that comes naturally to textiles. The reason polyester was chosen as the base material was because the fiber was already being researched for anti-static fabrics. At the same time, it was determined that multifilament would create the ideal base material. After twisting the multi-filament yarn, it was

decided that polyester would be the best fit as a base material from a cost perspective.

Yasuda notes, “Currently, we have the capability to create CNT textiles made from base materials using nylon, aramid, glass fiber, cotton, wool, silk, and others. However, depending on the physical configuration, thickness, and variability of the filament in the vertical direction, the electrical and physical properties will vary from one fiber to another.”

The Electro Yarn-T series, which is a very light solution that heats up rapidly when power is applied, is already being used commercially as a textile heater for snow melting applications. The goal for Electro Yarn-T is to find key partnership companies to explore other applications, and to sell at mass production volume.

Development is still at an early stage, and it is too early to highlight specific applications in outdoor apparel and gear, but Yasuda is optimistic for this market. He notes, “I expect that ‘Electro-Yarn’ can be used for electrically functional outerwear (heating and signal), electrical shoe heaters, and as a signal/power line for body sensors. Perhaps, it can also be used in tents, so that the tent material itself can have wiring pre-built inside.” ●

For more information on the Multifilament, Multi-Walled Carbon Nanotube (MWCNT) and “Electro-Yarn” research project, contact Yuji Yasuda at Marubeni America, [Yasuda-Y@marubeni.com](mailto:Yasuda-Y@marubeni.com), 669-231-7960.

Kathlyn Swantko, president of the FabricLink Network, created [TheTechnicalCenter.com](http://TheTechnicalCenter.com) for industry networking and marketing of specialty textiles, and [FabricLink.com](http://FabricLink.com) for consumer education involving everything fabric.

## The FabricLink Network

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### Why clients are excited about the benefits of The FabricLink Network

“The ever changing and improving Technical Center is a great way to drive traffic to our company. We are receiving inquiries from various aspects of the textile industry which gives us the opportunity to continue to research and develop technical fabrics for so many end uses.”

**Brenda Stamboulia**  
Director of Marketing  
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