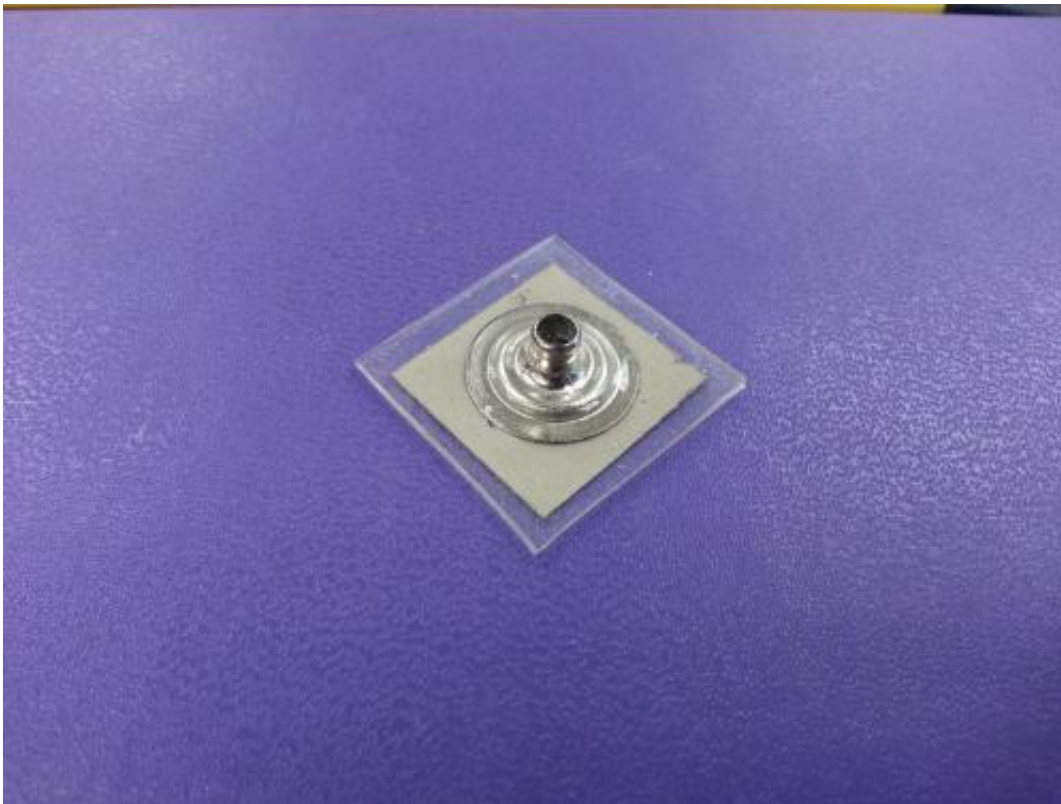


Wearable sensor clears path to long-term EKG, EMG monitoring

January 20 2015, by Matt Shipman



A new electrophysiological sensor developed at North Carolina State University is as accurate as the 'wet electrode' sensors used in hospitals for EKGs and EMGs, but can be used for long-term monitoring and is more accurate than existing sensors when a patient is moving. Credit: Yong Zhu

Researchers from North Carolina State University have developed a new, wearable sensor that uses silver nanowires to monitor

electrophysiological signals, such as electrocardiography (EKG) or electromyography (EMG). The new sensor is as accurate as the "wet electrode" sensors used in hospitals, but can be used for long-term monitoring and is more accurate than existing sensors when a patient is moving.

Long-term monitoring of electrophysiological signals can be used to track patient health or assist in medical research, and may also be used in the development of new powered prosthetics that respond to a patient's muscular signals.

Electrophysiological sensors used in hospitals, such as EKGs, use wet electrodes that rely on an electrolytic gel between the sensor and the patient's skin to improve the sensor's ability to pick up the body's [electrical signals](#). However, this technology poses problems for long-term monitoring, because the gel dries up - irritating the patient's skin and making the sensor less accurate.

The new nanowire sensor is comparable to the wet sensors in terms of signal quality, but is a "dry" [electrode](#) - it doesn't use a gel layer, so doesn't pose the same problems that wet sensors do.

"People have developed other dry electrodes in the past few years, and some have demonstrated the potential to rival the wet electrodes, but our new electrode has better signal quality than most - if not all - of the existing dry electrodes. It is more accurate," says Dr. Yong Zhu, an associate professor of mechanical and aerospace engineering at NC State and senior author of a paper describing the work. "In addition, our electrode is mechanically robust, because the nanowires are inlaid in the polymer."

The sensors stem from Zhu's earlier work to create highly conductive and elastic conductors made from [silver nanowires](#), and consist of one

layer of nanowires in a stretchable polymer.

The new sensor is also more accurate than existing technologies at monitoring electrophysiological signals when a patient is in motion.



The silver nanowire sensors conform to a patient's skin, creating close contact.
Credit: Yong Zhu

"The silver nanowire sensors conform to a patient's skin, creating close contact," Zhu says. "And, because the nanowires are so flexible, the sensor maintains that close contact even when the patient moves. The nanowires are also highly conductive, which is key to the high [signal quality](#)."

The new sensors are also compatible with standard EKG- and EMG-reading devices.

"I think these sensors are essentially ready for use," Zhu says "The raw materials of the sensor are comparable in cost to existing wet [sensors](#), but we are still exploring ways of improving the manufacturing process to reduce the overall cost."

More information: "Wearable Silver Nanowire Dry Electrodes for Electrophysiological Sensing" Amanda C. Myers and Yong Zhu, North Carolina State University; He Huang, North Carolina State University and University of North Carolina at Chapel Hill, Online Jan. 14, *RSC Advances*, [DOI: 10.1039/C4RA15101A](https://doi.org/10.1039/C4RA15101A) . pubs.rsc.org/en/content/article...a15101a#!divAbstract

Provided by North Carolina State University

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