狮城新闻

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English translation

NTU publishes in *Nature* again! Professors Chen Xiaodong, Gao Huajian, Liu Zhiyuan and Hu Benhui collaborate to develop flexible electrodes

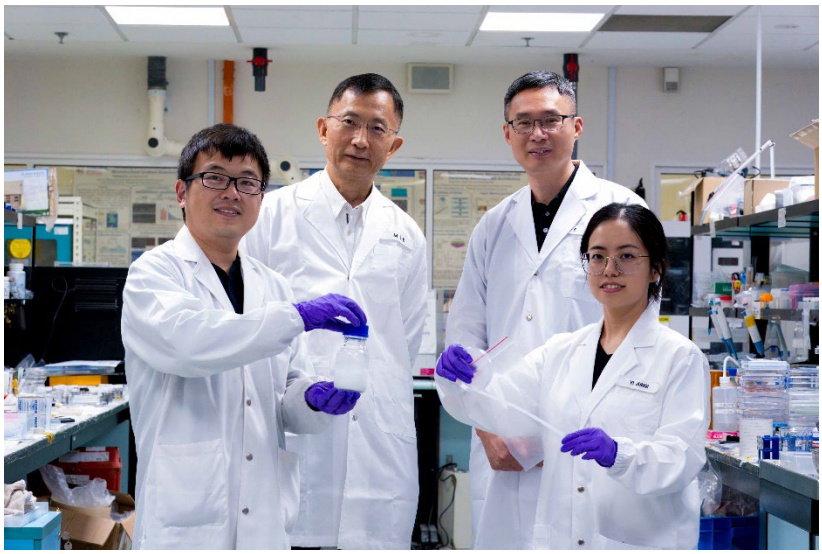
An international team led by Professor Chen Xiaodong and Professor Gao Huajian of Nanyang Technological University, in collaboration with Professor Liu Zhiyuan of the Chinese Academy of Sciences and Professor Hu Benhui of Nanjing Medical University, successfully developed a flexible electrode that mimics the properties of spider silk and published it in *Nature* in December. The electrode can wrap around tissue, provide electrical stimulation and record signals. Potential uses include monitoring heartbeat, nerve repair and wound healing, etc., potentially impacting the next generation of biomedical devices. Next, let's learn about this exciting research!

Spider silk revolutionises biomedical technology

An international team led by Professor Chen Xiaodong and Professor Gao Huajian of Nanyang Technological University, working with experts from the Chinese Academy of Sciences and Nanjing Medical University, developed an innovative flexible electrode. Currently, this result has been published in *Nature* in December 2023.

Inspired by spider silk, the unique electrodes fit snugly onto muscles, nerves and the heart to deliver electrical stimulation or record electrical activity.

Its biggest innovation is its ability to automatically shrink in humid conditions while being non-toxic to cells, making it more efficient and sensitive than traditional stretchable gold electrodes in delivering electrical pulses and recording electrical signals from biological tissues.



The Singapore team behind the innovation. From left: Dr Zou Guijin, research fellow from the Institute of High Performance Computing, Agency for Science, Technology and Research; Prof Gao Huajian of NTU's School of Mechanical and Aerospace Engineering; Prof Chen Xiaodong of NTU's School of

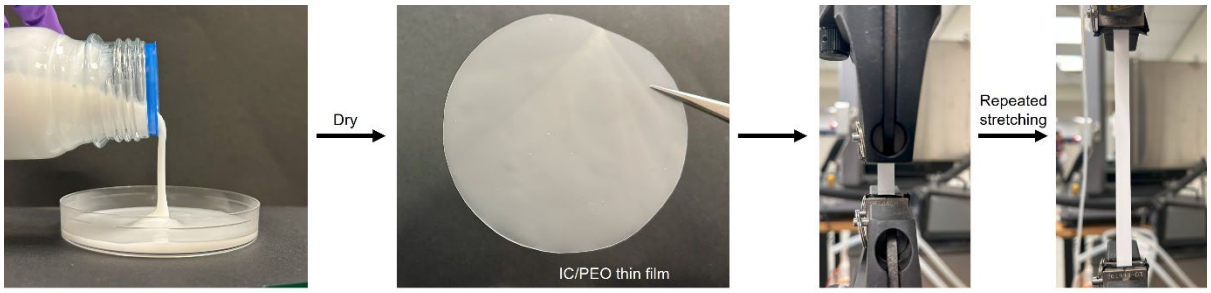
Materials Science and Engineering and Dr Yi Junqi, research fellow from NTU's School of Materials Science and Engineering and NTU's Institute for Digital Molecular Analytics and Science. Credit: NTU Singapore.

Improved performance and biocompatibility

The high conductivity and flexibility of spider silk inspired electrodes make them potentially useful in a variety of biomedical devices, such as implantable sensors and prosthetics.

Researchers were inspired by spider silk proteins when developing this new type of electrode, which shows great potential in biomedical applications.

Currently, the research team is working on improving the long-term stability of the electrode and optimising its performance to meet the needs of future clinical trials.

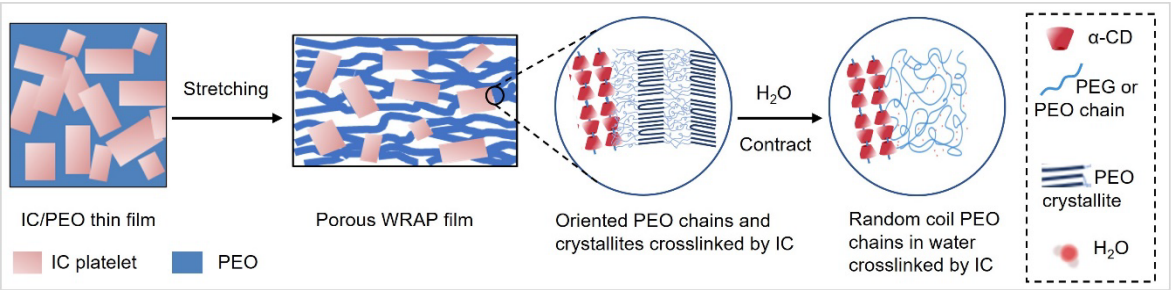


Making the contractile material: The mixture is poured and dried to form a film. Then, the film is stretched repeatedly. Credit: NTU Singapore.

Development of flexible, non-toxic electrodes

This technology allows electrodes to be mounted on curved surfaces such as human skin and organs, providing new possibilities for medical monitoring and treatment. This non-toxic and more sensitive electrode can effectively detect weak electrical signals such as abnormal heart rhythms in rats.

Reported in the journal *Nature*, this innovative technology has the potential to shape the next generation of medical devices for monitoring irregular heartbeats, repairing nerves, promoting wound healing and reducing scarring.



The PEO crystalline structures in the material break on contact with water, causing the film to become soft and contract. Credit: NTU Singapore.

Advances in Biomedical Devices

The emergence of spider-silk inspired electrodes marks a major advance in biomedical devices. Its combination of strength, elasticity and biocompatibility has important implications for future biomedical devices. This development opens up new possibilities for advanced biomedical devices and heralds a major leap forward for the industry.

In addition, researchers are also exploring biomimetic strategies to use genetically engineered biomolecules to combat metal corrosion, which not only helps prevent corrosion but also reduces greenhouse gas emissions and promotes the development of a sustainable bioeconomy.

In conclusion, the emergence of spider silk inspired electrodes represents a major leap forward in the field of biomedical devices. Its unique properties and biocompatibility open up new possibilities for the development of medical technology.

As researchers continue to explore and refine this technology, we can expect to see exciting advances in the next generation of biomedical devices!

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