

Pilot line boost for soft electronics

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Nanyang Technological University in Singapore has set up a pilot line for rapid prototyping ultrathin and stretchable electronics.

The systems developed in the lab at NTU detect bioelectric signals from skin, muscles and organs, and transmit these signals to control robots or other electronic devices. The soft substrate integrates different types of sensors for wireless connectivity, accelerometer, temperature sensing, and monitoring vitals like heart rate, blood pressure, oxygen levels, and more.

The resulting sensors, encased in a gel-like skin, are soft, flexible and stretchable that stick to the skin. These enable joint movement and come in various sizes and thicknesses, ranging from centimetres to sub-microns. The aim is to develop industrial processes for manufacturing.

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The most recent development from the lab is a biocompatible material that can readily shrink and wrap around soft tissues like the heart when moisture is applied. The developed materials achieved conformity and flexibility that enables real-time heart monitoring and reduces the risk of implant rejections. The technology can also help pave the way for newer types of better pacemakers and bio-monitors in future.

In agriculture, soft sensors attached to plants can monitor their health and control their actions for crop disease management. Similarly, low-cost smart sensors can also be used on food packaging as an indication of freshness and enhance food safety.

To kickstart the scaling-up process, NTU Professor Chen Xiaodong has established the pilot laboratory which aims to co-develop and produce soft electronic devices with industry partners, including Small and Medium Enterprises (SMEs).

Through joint projects, Prof Chen aims to develop industry standards for mass production of soft electronics in the future and develop the necessary expertise for this emerging industry.

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To enable electronic circuits to accommodate movement without breaking under repeated stress, these circuits are printed on soft substrates using intricate patterns at the micro and nanoscale,

about 10 times thinner than the width of human hair. One such pattern developed by Chen's team is a wavy ribbon form for soft electronics, which will allow it to stretch without breaking.

Another key technology is the BIND universal connector that joins flexible electronics by simply pressing them together. It can withstand stretching up to seven times its length and is 60 times tougher than conventional connectors. When used together, these technologies allow the combination of conventional hardware chips to be mounted and linked to resistors and capacitors through printed circuits.

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