

Role of Textiles in Heart Monitoring

N. Gokarneshan

Department of Textile Chemistry, SSM College of Engineering, Komarapalayam, Tamil Nadu, India.

***Corresponding Author:** N. Gokarneshan, Department of Textile Chemistry, SSM College of Engineering, Komarapalayam, Tamil Nadu, India.

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Textiles are used in heart monitoring by integrating conductive fibers and sensors directly into garments (e.g., shirts, straps, patches) to create comfortable, non-invasive, and continuous monitoring systems. These smart textiles capture physiological data like electrocardiogram (ECG) signals and heart rate, which can then be transmitted wirelessly for analysis.

How They Work

Smart textiles transform everyday clothing into active health monitoring devices through the integration of technology.

Conductive Materials

Non-conductive textiles (like cotton, nylon, or polyester) are made electrically conductive by incorporating materials such as silver, copper, carbon, or conductive polymers. This can be done by weaving conductive threads into the fabric or applying conductive coatings/inks.

Integrated Sensors

Miniature, flexible sensors are embedded within the fabric structure, often at specific anatomical locations on the chest to optimize signal acquisition.

Data Acquisition and Transmission

The textile electrodes pick up the heart's electrical impulses. This data is then sent to a small, integrated electronic processing unit (often a small pod clipped to the garment) that filters the signals and transmits the information wirelessly (via Bluetooth or Wi-Fi) to a smartphone app or cloud-based platform for real-time monitoring and analysis by the user or a healthcare professional.

Advantages

Comfort and Non-Invasiveness

Unlike traditional wired Holter monitors that use adhesive gel electrodes which can cause skin irritation over long periods, smart textiles are designed to be lightweight, breathable, and feel like regular clothing, encouraging long-term wear and patient compliance.

Continuous Monitoring

The integration into daily wear allows for seamless, 24/7 monitoring during various activities, including exercise and sleep, capturing data that might be missed during short clinical visits.

Remote Patient Monitoring

Data can be transmitted remotely to healthcare providers, enabling telemedicine applications, early detection of conditions like atrial fibrillation, and timely intervention without frequent hospital visits.

Durability

Many smart textiles are designed to be washable and robust enough to withstand everyday use, including stretching and bending, without significant degradation in performance.

Example Products

Hexoskin Smart Shirt

A biometric shirt that records ECG, breathing rate, and activity levels, transmitting data to smartphones for continuous monitoring.

Myant SKIN

This company has developed biometric clothing, including a washable shirt, that provides continuous monitoring of heart rate and other vital signs.

24sens Smartcor Control

A system consisting of a smart textile patch on a chest strap with a built-in ECG monitor and accompanying software for long-term recording and analysis of heart activity to detect conditions like atrial fibrillation.

Smart textiles use embedded electronic fibers and conductive inks to create comfortable, washable fabrics that act as non-invasive sensors, allowing for continuous, long-term heart monitoring (ECG, heart rate) during daily activities, detecting issues like irregular rhythms (AFib) more easily than traditional sticky electrodes, and providing data for personalized, proactive healthcare. These e-textile solutions offer better user comfort and potential cost savings by integrating sensors directly into everyday garments like T-shirts or chest bands.

How They Work

Sensor Integration

Conductive threads or inks (like silver, carbon, or polymer-based) are woven into or coated onto fabrics.

Sensing Principle

These textiles detect electrical signals (ECG) or physical movements (vibrations from heartbeats) from the chest.

Data Transmission

A small, removable module (e.g., "Pod") wirelessly transmits data (via Bluetooth) to a smartphone app for display and analysis.

Key Advantages**Comfort & Convenience**

Less skin irritation and better mobility compared to sticky electrodes, ideal for long-term or pediatric monitoring.

Long-Term Monitoring

Enables continuous data collection for detecting intermittent conditions like Atrial Fibrillation (AFib).

Proactive Healthcare

Offers trend data for chronic conditions, reducing reliance on sporadic clinic visits.

Washable

Designed to withstand repeated washing without losing function.

Examples & Applications**Knitted T-shirts**

Measure heart and respiration rates during movement.

Form-fitting Bands

Conductive yarn electrodes in elastic bands monitor ECG.

Smart Patches

Integrated with mobile apps for long-term heart rate and disease monitoring.

Future Potential

Integration with cloud services for advanced AI analysis.

Expansion to other vital signs and drug delivery.



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