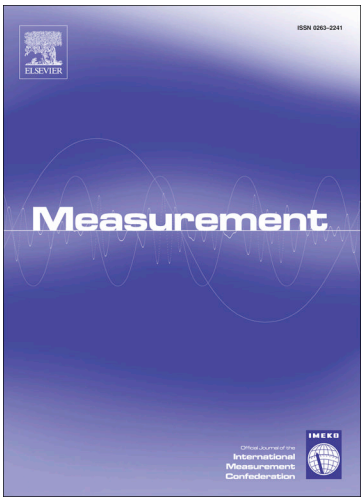

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Textile electrodes in capacitive signal sensing applications

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Abstract

This article introduces a capacitive measurement method for objective examination of textile sensor sensitivity within the frequency range associated with various biosignals. The proposed evaluation method is subsequently used to investigate biosignal sensing properties of a basic copper surface sensor and two selected textile sensors made from commercially available and commonly used conductive Shieldex and Elitex fibres. Experiment results indicate that the Elitex-based electrode is more suitable than Shieldex and copper surface electrodes. The signal attenuation of the Elitex electrode is lower by approx. 1-2 dB in comparison to the Shieldex electrode in the 0.5 Hz to 10 kHz frequency range. The copper surface electrode has slightly better signal transmission properties within low frequencies (< 3 Hz), however these are not considered critical in biosignal sensing.

Keywords

conductive textile, capacitive electrode, signal sensing

1. Introduction

Biosignal sensing without direct skin contact is gaining popularity in various areas of application [1–8] and can be used to record various electrical biosignals, including ECG, EEG or EMG [9,10]. The mentioned signals contain useful information pertaining to the physiological state of a person and as such are used in various diagnostic methods. Capacitive sensing of signals has several advantages – for example it is not necessary to apply an electroconductive gel between the skin and the electrode, which in turn reduces the preparation time for the measurement and moreover, can avoid skin irritation in case of allergic reaction to the applied gel. Other problems include the drying-out of the gel over the course of time, especially in long term measurements, and electrical shorting between very close electrodes. Some research papers use rigid, metal plate electrodes for capacitive signal acquisition. However, wearing rigid electrodes is uncomfortable, especially for long-term monitoring. In this aspect, conductive textile electrodes present a