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Simple fabrication method of an ultrasensitive gold micro-structured dry skin sensor for biopotential recording

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ABSTRACT

Fast advancement of dry biopotential electrode has driven to the reduce of using Ag/AgCl (wet electrode). There is a necessity for development of flexible and eco-friendly micro-structured (MSE) dry biopotential electrode utilizing biodegradable and non-toxic materials for a better life and sustainable future. It is very difficult to create micro-structure without using any solvents or high-end equipment. Here, a novel micro-structured electrode coated with Ti/Au film is fabricated using a sandpaper template and is proposed for biopotential signal monitoring applications. We used sandpaper, which is recyclable and biodegradable. The proposed MSE is a flexible, stretchable, and biocompatible dry micro-structured electrode. The sheet resistance of the proposed MSE is 2.5 Ω/sq. The area of MSE was only 4 cm × 4 cm (l × w), and the sweat of the epidermis layer of human skin could be utilized as the electrolyte for the flexible MSE during the electrocardiography (ECG) and electromyography (EMG) recording. The fabricated MSE was enough thin and flexible to be well attached onto the skin. The contact impedance of the flexible MSE was stable and suitable for long-term biopotential recording. The main advantage of the electrodes is simple fabrication, which can be used in wearable electrode systems to monitor human health. The results of the experiment show that the proposed electrode can operate in dry conditions when the subject is resting, and it shows fewer motion artifacts during movement.

Keywords: ECG; EMG, Dry electrode; MSE; Hard electrode; Wet electrode; Biopotential