ABSTRACT

EMG (Electromyography) is a method of recording signals produced by the muscles of the human body using a recording device. The recording device is commonly referred to as an electromyograph while the results of the recording from the device are an electromyogram. The development of electrodes in EMG devices is necessary to improve the quality of measurement results and increase comfort for users in the process of using them. The development to be initiated is to make flexible electrodes for measuring biopotential signals on EMG devices as a substitute for commercial electrodes that are commonly used with Ag/AgCl materials. By considering the side effects of using gel-shaped EMG electrodes for long-term measurements, the flexible electrode form to be developed is a thin film with ZnO/PVA nanocomposite material. The results of the fabricated flexible electrode produced a conductivity value with the highest number of 154.107 S/m and the highest SNR value of 20.667 dB, this highest value was obtained from the addition of 5% wt graphene which proves that the more graphene concentration used, the better the resulting flexible electrode.

Previously, the addition of 5% wt graphene doping was determined with four variations of thickness (pouring volume) for the flexible electrode. Thus, this paper will elucidate the variations in surface area. Characterization of electrical, mechanical, and morphological properties, as well as SNR and impedance tests, was conducted. By introducing variations in the electrode's surface area, the SNR results revealed that the electrode's surface area is directly proportional to its ability to receive biopotential signals effectively. However, the non-uniform distribution of doping causes agglomeration, leading to an increased contact resistance between the electrode and the skin.

The process of making flexible electrodes has been determined by adding 5% graphene with four variations of pouring volume. For the volume of pouring that is done is 10; 6.7; 5; and 4 ml with each average thickness is 0.186; 0.163; 0.086; and 0.071 mm. Tests were carried out to see the characteristics of the electrical and mechanical properties, as well as the SNR value and the impedance test that was carried out. By varying the pouring volume, it can reduce the value of resistance and unwanted cavities, thereby increasing the accuracy of the resulting EMG signal.

Keywords: ZnO/PVA, Graphene, electrode, EMG