FABRICATING A SOLID-STATE REFERENCE ELECTRODE WITH LONG-TERM STABILITY FOR SWEAT MONITORING SYSTEM

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Abstract: Valuable biomarkers such as glucose or enzymes are found in human sweat, making it a great resource in diagnosing and measuring biomarker concentrations. However, many commercial sweat monitoring systems are bulky and expensive. Therefore, our goal is to develop a wireless system that is flexible, reliable, and non-invasive. The first step of this project is to fabricate a solid-state reference electrode with long-term stability and Ag/AgCl electrode is chosen due to its ease of fabrication. From the previous works, silver (Ag) wires are first immersed into 1M FeCl3 solution to form a thin layer of AgCl and then coated by 1 mM MCH to reduce the dissolution rate of AgCl. The current study focuses on investigating various salt-containing membranes as the third layer to minimize potential drifts on the reference electrode. The two mixtures of PVB + NaCl + methanol, and PVA + KCl + DI water have been explored and drop casted on the fabricated reference electrodes. The potential differences between the electrodes and commercial reference electrode in different pH solutions are measured by using a digital multimeter to test the stability. Energy dispersive X-ray spectroscopy (EDS) is used to determine the concentration of each element in the solution to discover how each solution contributes to the performance, and to detect the drawbacks. Results show that the mixture of PVA + KCl + DI water takes a much longer time to dry out compared to the mixture of PVB + NaCl + methanol. The EDS results indicate that the solution of PVB + NaCl + methanol is not effective since sodium and chloride molecules are not detected. This result can be improved by modifying the concentration or changing the compound. The outcome of this research may provide additional information for future research regarding the fabrication of Ag/AgCl reference electrode.

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