ABSTRACT

Escherichia coli (E. coli) is one of the bacteria that can cause diseases, particularly diarrhea. The bacteria can be ingested by humans through various means, one of which is contaminated food or drink. Current methods for detecting E. coli are still conventional, such as PCR and ELISA, hich require a long time, ranging from hours to days.

In the Capstone Design titled "Development of an E. coli Bacteria Detection System Based on ZnO/PVA Nanocomposite," a Graphical User Interface (GUI) is developed using the Python programming language for detecting E. coli bacteria using electrochemical methods. In this detection, the Cyclic Voltammetry (CV) technique is used to obtain I-V test graphs. The developed GUI offers four features, including the CV testing technique and a feature called Check Concentration, which can read the concentration of tested bacteria at specific concentrations. Another feature is Auto Plotting, which helps users plot data saved on the computer. An additional feature is the Square Wave Voltammetry (SWV) testing technique, which is one of the electrochemical testing techniques.

Testing E. coli bacteria at concentrations of 1x10^5 CFU, 1x10^6 CFU, 1x10^7 CFU, and 1x10^8 CFU shows that the ZnO/PVA nanocomposite-based sensor can detect up to 1x10^6 CFU. The current peak due to redox reactions does not show a current spike at a concentration of 1x10^5 CFU. The current increases with the increase in bacterial concentration, with current spikes indicating redox reactions found at 0.05 volts to 0.20 volts. The obtained current peaks demonstrate a linearity with an R-square of 0.9954.

Keywords: Escherichia coli (E. coli), Nanocomposite, ZnO, PVA, Cyclic Voltammetry (CV), Biosensor.