Conductometric immunosensor for specific Escherichia coli O157: H7 detection on chemically funcationalizaed interdigitated aptasensor

ABSTRACT

Escherichia coli O157:H7 is a strain of Escherichia coli known for causing foodborne illness through the consumption of contaminated or raw food. To detect this pathogen, a conductometric immunosensor was developed using a conductometric sensing approach. The sensor was constructed on an interdigitated electrode and modified with a monoclonal anti-Escherichia coli O157: H7 aptamer. A total of 200 electrode pairs were fabricated and modified to bind to the target molecule replica. The binding replica, acting as the bio-recognizer, was linked to the electrode surface using 3-Aminopropyl triethoxysilane. The sensor exhibited excellent performance, detecting Escherichia coli O157:H7 in a short time frame and demonstrating a wide detection range of 1 fM to 1 nM. Concentrations of Escherichia coli O157:H7 were detected within this range, with a minimum detection limit of 1 fM. This innovative sensor offers simplicity, speed, high sensitivity, selectivity, and the potential for rapid sample processing. The potential of this proposed biosensor is particularly beneficial in applications such as drug screening, environmental monitoring, and disease diagnosis, where real-time information on biomolecular interactions is crucial for timely decision-making and where cross-reactivity or interference may compromise the accuracy of the analysis.