

Preface

The planar interdigital sensing approaches have long been employed. It has been used as one of the nondestructive testing (NDT) methods to evaluate the material properties. Currently, the numbers of research works in developing planar interdigital sensors are increasing. The applications of these sensors will depend on both the characteristic of the particular sensor chosen and also on the characteristic of material under test. Though there are many publications on the topic, the book will provide very useful information and basic knowledge to design, develop, and analysis of planar interdigital sensors.

The complete book is divided into seven chapters.

Introduction to planar interdigital sensors was discussed in the [Chap. 1](#). Various applications of these sensors have been described and explained. For implementing an interdigital sensor the basic knowledge of this chapter is very important.

[Chapter 2](#) describes on the operating principle of interdigital sensors, analysis of concept design based on circuit analysis, and finite element analysis (COMSOL modelling). The sensors design of conventional electrode structures and novel design of interdigital sensors with new electrode structures of different configurations have been described in details. And also explanation on different fabrication process with different sensors substrates.

In [Chap. 3](#), the experimental investigations have been conducted for impedance characterizations of the fabricated sensors of different configurations. The experiments include characterization in air, characterization with sodium chloride (NaCl) and different pH buffers, characterization with different peptides (sarcosine and proline), and characterization with LPS O111:B4 purchased from Sigma. Analysis of results was presented using Nyquist and Bode plots.

[Chapter 4](#) explains the coating and immobilization procedures to achieve selectivity. Different coating materials or cross linkers (carboxyl-functional polymer, APTES (3-aminopropyltriethoxysilane), and Thionine) have been introduced with different coating techniques to study which cross linker can effectively bind to the Polymyxin B (PmB) molecules and improve the selectivity and sensors performance. In this chapter, the details on immobilization steps and procedures are described.

In [Chap. 5](#), the experimental investigations with endotoxin from LPS O111:B4 and standard endotoxin from LAL test assay were performed. Impedance spectroscopy (IS) method, introduced an appropriate equivalent circuit model to

estimate impedance parameter and curve fitting using complex nonlinear least square method (CNLS), has been discussed. Statistical analysis using principal component analysis (PCA) has been carried out. In this chapter, the images of noncoating, coating electrodes, and immobilized PmB have been taken using Scanning Electron Microscope (SEM) and Atomic Force Microscope (AFM). Also being described in the chapter is the experiments of different coating thickness and their response to standard endotoxins. The validation of sensors measurement as compared to standard endotoxin tests with chromogenic LAL endotoxin assay kit. Finally, the stability, selectivity, and reproducibility of coating sensors have also been explained.

Food sample test and analysis are described in [Chap. 6](#) of the book. Analyses have been conducted to observe whether sensors can discriminate between non-contaminated food samples with contaminated food samples with very minimum endotoxin concentration. Analyses were also conducted for contaminated food samples at different temperature conditions.

The conclusions which highlight the output from the research work are described in [Chap. 7](#). The readers will get a very good idea about the summary of the development of planar interdigital sensors and their implementation.

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