VIETNAM NATIONAL UNIVERSITY, HANOI
**VNU UNIVERSITY OF ENGINEERING AND TECHNOLOGY**

**SOCIALIST REPUBLIC OF VIETNAM**
**Independence – Freedom – Happiness**

## INFORMATION ON DOCTORAL THESIS

1. Full name : Vũ Quốc Tuấn..... 2. Sex: Male.....

3. Date of birth: 2st/November/1983..... 4. Place of birth: Hanoi .....

5. Admission decision number: 1006/QĐ-CTSV Dated 7th/December/2015 by Reactor of University of Engineering and Technology, VNU.

6. Changes in academic process:

- Change the responsibity of professors following the decision No: 995 QĐ-ĐT, 15th, October, 2018 by Reactor of University of Engineering and Technology, VNU with the order below:

+ Assoc.Prof.Dr. Bui Thanh Tung.

+ Prof.Dr. Chu Duc Trinh.

- Modify the tile from "Study on protein detection based on sensing microfluic channel " to "Development of a protein detection system based on protein-preconcentration microfluidic system with integrated co-planar capacitive micro immunosensor" that is suggested to change at first round of the thesis defence cometee on 3th,November, 2020.

7. Official thesis title: Development of a protein detection system based on protein-preconcentration microfluidic system with integrated co-planar capacitive micro immunosensor

8. Major: electronic 9. Code: 62520208

10. Supervisors:

+ Assoc.Prof. Dr. Bui Thanh Tung.

+ Prof. Dr. Chu Duc Trinh.

11. Summary of the **new findings** of the thesis:

- Study and successfully develop of an integrated two-electrode coplanar capacitive immunosensor inside a preconcentration microfluidic chip for protein selection and detection to replace the conventional bulky optical-based protein detection system. The breakdown voltage to create nano-fracture and working of the pre-concentrator archived below 50VDC, brings convenience to integrated immunosensor in the microfluidic chip and avoids damage may course by the applied high-voltage inside the microfluidic channel.

- Study and develop an impedance and capacitance measurement module that special used for two-electrode coplanar immunosensor inside microfluidic channel. The developed results can help to build a compact diagnostic system.

- Study and analys the model of the two-electrode capacitive coplanar immunosensor with Comb structure to suggest protein detection method based on capacitance measurement at high frequency and low voltage. The suggested measurement method can be used to detect biochemical layers binding on the electrodes during the Antibody self-assembly process and to detect the present of trapped protein on the electrodes.

12. Practical applicability, if any: The protein chip is highly potential candidate in diagnostic device for point of care application. The combination of the protein chip and the impedance measurement module can produce a low-cost, compact, and portable device for diagnostic disease.

13. Further research directions, if any:

Based on the initial results obtained from this study, further studies can be implemented including improve the sensor sensitivity and detection capacity of the whole system; and optimize the whole system for specific protein, for example, detection of NSE protein for early detection of small cell lung cancer.

14. Thesis-related publications:


1. Tuan Vu Quoc, Meng-Syuan Wu, Tung Thanh Bui, Trinh Chu Duc, and Chun-Ping Jen, “A compact exclusion-enrichment microfluidic chip with integrated impedance biosensor for low concentration protein detection”, TRANSDUCERS Conference 2017.
2. Tuan Vu Quoc, Meng-Syuan Wu, Tung Thanh Bui, Trinh Chu Duc, and Chun-Ping Jen, “A Compact Microfluidic Chip with Integrated Impedance Biosensor for Protein preconcentration and Detection”, Biomicrofluidics 11, 054113 (2017) (tạp chí thuộc danh mục ISI).
3. Vu Quoc Tuan, Ngoc-Viet Nguyen, Meng-Syuan Wu, Chun-Ping Jen, Bui Thanh Tung, Chu Duc Trinh “Development of an Impedance Spectroscopy Measurement Circuit Board for Protein Detection” ICCE conference 2018, pp184-188.

4. Tuan Vu Quoc, Tung Thanh Bui and Trinh Chu Duc “A Study on Electrical Parameters Of Interdigitated Array Electrodes (Ideas) Sensor For Concentration Measurement Of Phosphate-Buffered Saline”, IWNA 2019 Conference, p315-318.
5. Tuan Vu Quoc, Viet Nguyen Ngoc, Tung Thanh Bui, Chun-Ping Jen, and Trinh Chu Duc" High-Frequency Interdigitated Array Electrode-Based Capacitive Biosensor for Protein Detection" Biochip journal, 13, 403–415(2019) (tạp chí thuộc danh mục ISI).
6. Tuan Vu Quoc, Viet Nguyen Ngoc, Bao-Anh Hoang, Chun-Ping Jen, Trinh Chu Duc, Tung Thanh Bui, "Development of A Compact Electrical Impedance Measurement Circuit for Protein Detection Two-Electrode Impedance Micro-Sensor", IETE Journal of Research(2021) DOI:10.1080/03772063.2021.1893230 , (tạp chí thuộc danh mục ISI).

*(List them in chronological order)*

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| Date: …….. | Date: …….. |
| Signature: …… | Signature: …… |
| Full name: …… | Full name: …… |

*Note: **“Information on Doctoral Thesis”** must be processed on Microsoft Word, font Unicode Times New Roman, letter size 13. “ Summary of the new findings of the thesis” should be one-A4 page long.*