

UNIVERSITI TEKNOLOGI MARA

**THE BIOSENSING PERFORMANCE AND
ELECTROCHEMICAL PROPERTIES OF NON-
CARBONISED ELECTROSPUN NANOFIBERS**

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ABSTRACT

In this study, there are four samples based on Poly (Acrylic Acid) (PAA) and Polyacrylonitrile (PAN) (PAA/PAN) polymer. The sample with only PAA/PAN act as bare which not included with any other materials. The other three samples were mixed with different types of material which is Gold Nanoparticles (AuNPs), reduced Graphene Oxide (rGO) and Iron(III)Oxide (Fe_2O_3). Firstly, the PAA/PAN based polymer solution undergo electrospinning process producing PAA/PAN, PAA/PAN/AuNPs, PAA/PAN/rGO and PAA/PAN/ Fe_2O_3 nanofibers. The nanofibers then being analyzed by Cyclic Voltammetry (CV) to check whether there is any redox reaction takes place on the nanofibers and to study the electrochemical properties of the nanofibers. It was found that PAA/PAN/rGO nanofibers showed the best biosensing performance followed by PAA/PAN, PAA/PAN/AuNPs and PAA/PAN/ Fe_2O_3 due to electrochemical properties shown by the obtained data. Both concentration dependence study and scan rate dependence study showed PAA/PAN/rGO nanofibers have the highest current detection and highest redox reaction, respectively. Besides, Electrochemical Impedance Spectroscopy (EIS) analysis was conducted to check the conductivity of the nanofibers. From the EIS analysis, it showed that PAA/PAN/AuNPs nanofibers have the highest conductivity compared to others. The objectives of this study was achieved.

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Chapter One: Introduction

1.1 Research Background

Diabetes. One of the global health problem that rigorously spreading around the world. The star online reported that Malaysia is considered as the worst country in Asia with the highest ranking of diabetes problems. Datuk Dr. Mustaffa Embong the executive chairman of National Diabetes Institute (NADI) said in a conference that our beloved country, Malaysia was the number one Asian country with high rate of diabetes and categorized as one of the highest in the world, probably right after Saudi Arabia [1]. He added, 2.5 million adults in Malaysia with the average age starting from 18 years old and above are estimated to have diabetes. More surprisingly, most of those people do not even know that they have diabetes.

This problem seems to rise up and many researchers out there trying to solve and prevent this problem with so many ways and initiatives. According to National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), the term of diabetes is defined as a disease with excess sugar in the body. Similarly said, there are high glucose level in the blood. The symptoms of diabetic person are hunger, always thirsty, high volume of urine produced, loss of weight and fatigue.

Malaysia is obviously known as food heaven because there are too many types of amazing food including nasi lemak, rendang, roti canai, nasi kandar, laksa and lots more to list. More interesting about our food is the diversity of the food itself since we have different races, Malay, Chinese and Indian, where our food also turn out to be very unique. Even mamak also serve good food here in Malaysia.

However, having good food does not mean that we can eat everything without hesitation. Malaysian likely to ignore healthy lifestyle and consuming too much sugar in their daily life. For example, taking the best drink ever in Malaysia, teh tarik every morning, without they realize this could lead to the silent killer, diabetes. Nowadays, people need to be more concern about what they eat and take care of their healthy lifestyle to avoid any health problem in the future.