UNIVERSITI TEKNOLOGI MARA

# EVALUATION OF REDUCED GRAPHENE OXIDE-ZEOLITIC IMIDAZOLATE FRAMEWORK ONTO NANOFIBERS

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# ABSTRACT

Nowadays, with the increasing of the industry in world, many heavy metal related issues is arise and increase every year. Researcher have been trying to incorporate the sensor with nanomaterial to increase the detection properties of the sensor and making those sensor to be more selective and sensitive. The material that is usually incorporated with heavy metal sensor is graphene oxide (GO) because of the thermal properties but it have some issue such as limitation when using in many electronic devices. Thus, for this study, reduced graphene oxide (rGO) is used rather than GO because the good electric properties and lower cost to fabricated, but the rGO have issue with the sensing response and the times for the recovery. Hence, rGO is combined with zeolitic imidazolate framework (ZIF) to improve the sensing properties of rGO. Therefore, the combination of rGO-ZIF is incorporated with PEI to increase the conductivity of the electrospun fiber mats produced. The fiber mats is then analyzed by using porosity test, contact angle test, and conductivity test. Results from this analysis shows that the conductivity of the electrospun PEI is increased with the addition of rGO-ZIF which is from $3.0764 \times 10^{-6}$ S/cm without addition of rGO-ZIF to $2.3600 \times 10^{-4}$ S/cm with addition of rGO-ZIF at 0.3 wt % concentration of rGO-ZIF.

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# TABLE OF CONTENT

# CHAPTER ONE
# INTRODUCTION

## 1.1 Research Background

Heavy metal such as arsenic, mercury, cadmium, chromium, and lead are substances that can pollute the environment. This heavy metal is causing by the industrial effluent discharge of the activities such as electroplating, mining, fabrication of batteries and microelectronics (Vilela et al., 2016). The heavy metal can affect the health of human beings, causing heavy metal poisoning in the body. According to Liu et al., (2017), heavy metal is a substances that can be enhanced many times and when this heavy metal is consumed by aquatic animals and plants, this will causing heavy metal pile up into them. Later, when this animals and plants is consumed by the human, heavy metal poisoning will occurred and causing disease like Minamata disease and worst scenario is death.

The sources of heavy metal are usually from the industry plant. However, in the country that do not have industrial plant, the sources of heavy metal are coming from landfills. In developing country, landfills is the key technique in handling household waste and the waste separation system is also absent thus the many hazardous material are transferred to the landfills. Heavy metal stays in the environment for a very long time because it is not decomposed by the microorganism and chemicals making it more dangerous for long term (Ishchenko & Vasylkivskyi, 2020). The study from Mičijević et al., (2020), state that heavy metal can contaminate agricultural soil by initiation of dangerous substances through water, air or the accumulation on or in soil above the allowable concentration. Contamination of soil by heavy metals will result in long term period that will affect the fertility and soil quality as well as causing toxicity to the plants and to the person and animal who consume it. Consequences of heavy metal can be carcinogenic and mutagenic. Children who expose to the heavy metals toxicity will having