UNIVERSITI TEKNOLOGI MARA

MORPHOLOGICAL STUDY OF SiO_2 BIOCOMPOSITE

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Thesis submitted in fulfillment
of the requirements for the degree of
Bachelor of Engineering (Hons) Chemical

Faculty of Chemical Engineering

July 2019

ACKNOWLEDGEMENT

In preparing this report, I have received and gained helps, encouragement, guidance, critics, and knowledge from my research project supervisor, Madam Suhaiza Hanim Binti Hanipah. Therefore, I wish to express my sincerest appreciation to her. Without her continued support and interest, this research project would not have been able to be realized. All of the suggestions and criticisms contribute to the improvement of this project.

I would also like to show my gratitude to fellow friends from EH220 Part 8 March–July 2019 batch for their guidance, sharing information and knowledge. Their support, encouragement and assistance play a vital role in completing this project.

Finally yet importantly, I owe my deepest gratitude to my beloved parents and family for always supporting me throughout the journey. They have always encourage me to be patient and strong. They also become the source of strength and determination that helped me to persevere in this journey.

ABSTRACT

In recent years, the world have shown developing enthusiasm for natural fibers as strengthening material in composites fundamentally because of ecological concerns and consciousness of constraining non-renewable resources to deliver petrochemical based engineered polymers. Natural fiber that is used to reinforce composite has the presence of silica bodies. Though the general effect of silica bodies in the plant contribute to the growth of the plants is known, the real effect of its function towards the strength of composite remains unclear. The objectives of this study are; (1) to study the morphology of SiO_2 biocomposite; and (2) to study the SiO_2 effect towards the biocomposite strength. The OPMF grafting LLDPE (OPMF-g-LLDPE) was produced via twin-screw extruder and hot press moulding at varying fibres content. The biocomposite of LLDPE-g-MA/SiO2 was prepared in three different weight percent (wt%) which are (93,2,4,1), (91,4,4,1) and (89,6,4,1) that represent weight percent of LLDPE, SiO_2, peroxide and maleic anhydride. This study is attempting to imitate or mimic the composition of SiO_2 in oil palm mesocarp fiber (OPMF). The results are obtained by performing scanning electron microscopy (SEM) analysis with variation of different SiO_2 insertion based on the effect of cutting techniques and the surface of the sample being rubbed by sand paper. The SiO_2 insertion used is 5wt%, 10wt% and 15wt%. The results showed that there are different morphological features for different cutting techniques, which is cutting by using liquid nitrogen and due to tensile stress. The results also showed that the SiO_2 granules have irregular shapes as they have sides and angles of any length and size. There are also clearer signs of agglomeration in the composite with lower content of SiO_2. The study concluded that as the fiber weight increases, the strength of the resulting composite is also increases.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Since ancient times, biocomposites is already known and utilized by humankind. However, the use of these things were completely outran in twentieth century by the use of synthetic polymers in industry (Vilaplana et al., 2010). Recently, the interest on biocomposite materials has shown an increment due to the potential of being substitute to conventional materials used in manufacturing industries. Biocomposite materials are produced with natural fibers or natural resins instead of the synthesized ones. The bio-based fibers are usually obtained from plants or animals (Yıldızhan et al., 2018). Basically, biocomposites are used to supplant or preserve non-renewable energy sources and petrochemicals. It has been well documented that biocomposites have potential benefits for example, minimal effort, great thermal properties, low thickness and non-rough preparing. Thus, it is essential to put to use these biocomposites and assimilate them into biodegradable polymer and improving its properties as well as reducing the production cost (Kamarudin et al., 2018).

As per ecological concerns and budgetary issues, natural fibers have turned out to be intriguing and captivating these days to be used as a modern material and auxiliary material for restoring of structures. Oil palm fiber is one of the large agriculture waste. Oil palm empty fruit bunch fiber (OPF) is a natural fiber, which is discovered a great deal in tropical regions. Researchers have used OPF fiber with many types of resins such as epoxy, polypropylene, polyester, and phenol formaldehyde (Mahjoub et al., 2013). The fuse of these oil palm fibers significantly enhances the mechanical performance of phenol–formaldehyde resin. The resultant composite item will be a financially savvy and value-added substitute for regular building materials which can go about as a superior substitute for wood in building industry (Sreekala et al., 1997).

There are embedded silica bodies at the surface of oil palm fiber (Hanipah et al., 2015). Silica is known to ease different wellsprings of worry in plants including herbivory, pathogens, dry season, and substantial metal poisonous quality. Silica accumulation by plant such as grass is regularly viewed as an adjustment for increased herbivore pressure. The testimony of silicon into epidermal cells of grass species is