

**UNIVERSITI TEKNOLOGI MARA**

**SYNTHESIS AND  
CHARACTERIZATION OF OVEN-  
DRIED OIL PALM EMPTY FRUIT  
BUNCH - BASED XEROGELS FOR  
ABSORPTION OF ENGINE OIL**

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**December 2021**

## AUTHOR'S DECLARATION

I declare that the work in this thesis. was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research


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## ABSTRACT

Recently, environmental pollution especially oil-related pollution has become serious due to rapid industrialization. Industries usually have engine oil as scheduled waste in liquid form, thus have tendency to spill by accident. This research was conducted to prove ability of xerogel in absorption of engine oil, by synthesizing and characterizing xerogel via Scanning Electron Microscopic (SEM), Brunauer-Emmett-Teller (BET), Thermogravimetry Analysis (TGA), X-ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR). Xerogel from this study was derived from mixture of sodium alginate, EFB,  $\text{CaCO}_3$  and GDL via internal gelation and oven drying. Absorption of engine oil was analysed in terms of effect of mass of sodium alginate, calcium carbonate ( $\text{CaCO}_3$ ), empty fruit bunch (EFB) and glucono-delta-lactone (GDL). Investigation on relationship between chemical and material on absorption capacity of engine oil was done in Response Surface Methodology (RSM). From the analysis of variance, percentage weight over volume of sodium alginate,  $\text{CaCO}_3$  and GDL were significant to the experiment. Optimization of the RSM model determined optimal condition for absorption, which was 0.1 sodium alginate,  $\text{CaCO}_3$ , EFB and 2.0 GDL. The absorption capacity obtained from that condition was 10.67 g/g (gram oil/gram absorbent). The optimal condition was in line with effect of chemicals, in which GDL had to be the highest compared to others; sodium alginate, EFB and  $\text{CaCO}_3$ . This research successfully proved that xerogel has potential in absorption of engine oil. This research will also open new pathway in developing sorbent based empty fruit bunch for problems related to absorbing oil.

## ACKNOWLEDGEMENT

First, I would like to thank Allah for giving this opportunity to pursue my master's studies at Universiti Teknologi MARA (UiTM), and for completing the epic and challenging journey successfully. I would like to express my gratitude and thanks to my main supervisor Assoc. Prof. Dr. Azil Bahari Alias, and my co-supervisor Dr Ana Najwa Mustapa, for all their support and guidance in helping me throughout this project. I would also like to express my gratitude to all the staff and fellow friends at the Faculty of Chemical Engineering, UiTM Shah Alam who helped me, whether directly or indirectly, accomplish this challenging project.

My appreciation also goes to all of the suppliers who helped provide all of the necessary equipment, materials, and chemicals for this project, whom which without their support, this project could not have been carried out smoothly.

Finally, I dedicate this thesis for my loving family, who gave me much morale as well as financial support to help me complete this challenging project up to the very end. Alhamdulillah.

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