

UNIVERSITI TEKNOLOGI MARA

**SYNTHESIS AND
CHARACTERIZATION OF
GRAPHENE FROM PALM OIL ON
NICKEL SUBSTRATE VIA
THERMAL CHEMICAL VAPOUR
DEPOSITION**

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Thesis submitted in fulfillment
of the requirements for the degree of
**Master of Science
(Chemistry)**

Faculty of Applied Sciences

August 2022

ABSTRACT

In recent decades, the discovery of carbon nanotube and fullerene has effectively opened up a new dimension in materials technology and science. The breakthrough discovered that graphene is a new two-dimensional carbon allotrope has greatly expanded research in this area. The challenges for scientists are to produce uniform graphene and scalable production to be used in the industry. Graphene is traditionally manufactured from fossil fuels that are highly poisonous, such as methane, acetylene and ethanol, benzene, xylene, and toluene, among other things. The cost of these precursors is high, and their supply has been decreasing for several decades due to the fact that they are non-renewable resources. In this research includes the synthesis of graphene using a process of thermal chemical vapour deposition, carbon precursor (palm oil) and techniques of characterisation used. The overview of the synthesis variations and graphene characterisation techniques will be discussed in this thesis. The Nickel substrate was used in this experiment because it is high carbon solubility materials, which mean as many as carbon atoms could deposited on the substrate surface before cooling down process occur. Raman spectra have demonstrated the annealing time at 15 minutes was the optimized time to synthesis the graphene. The G and 2D band were at 1594 cm^{-1} and 2703 cm^{-1} , respectively. At 15 minutes annealing time, the ratio of ID/IG was the lowest value compared to other deposition temperature. The ratio showed that synthesized graphene at this deposition temperature is high quality graphene. It was supported by the XRD pattern, at 15 minutes, the FWHM of [200] was 0.21° and it was the lowest value compared to other synthesis time. The surface roughness showed high value at 15 minutes which is 296 nm. The FESEM images shown the graphene sheets grown at the edge of the grain. The deposited graphene was not uniform due to the grain boundaries between nickel grain at different phase. The synthesized graphene was shown in the HRTEM images, and the graphitic layers was observed. The percentage of reflectance in UV-VIS spectra was observed at lower than 40% in the range between 200 and 300 nm. There are three significant parameter that has been set to synthesis high quality graphene which are deposition temperature, synthesis time and annealing time. The graphene deposited from palm oil as a precursor had the potential to be a low-cost, eco-friendly, and renewable material.

ACKNOWLEDGEMENT

Firstly, I would like to thank Allah S.W.T. for giving me the strength, health and blessing to finish this study. It has been a long and tough journey for me and everyone around me. Without your blessing, none of this is possible.

Thank you as well for my inspiring supervisor, Prof. Engr. Dr. Mohamad Rusop bin Mahmood and my late co-supervisor, Prof. Dr Sharifah Bee Abd Hamid for their advice, encouragement and guidance throughout the research. Their mentoring technique is special and one of a kind. I really hope we will continue to collaborate in future endeavors. Next, I would like to thank all of my lab mates such as, Nurul Hidah Sulimai, Najwa Ezira Ahmed Azhar, Nur Amierah Mohd Asib, Siti Zulaikha Umbaidillah, Nurul Afaah Abdullah, Shamsul Faez Mohamad Yusop, Noor Asnida Asli, Muhammad Salleh Shamsudin, Maryam Mohammad, Ain Zubaidah Maslihan, Azlinda Ab Aziz, Mohd Faizal Achoi, Mohamad Zuhairi Borhan, and many more. Not to forget Mr. Mohd Azlan Jaafar and Mrs. Nurul Wahida Aziz for their continuous support even on weekend.

Special thanks for Mrs Shaheda Ismail and Mr Abul Khamis from Faculty of Applied Sciences. A billion thanks for suppliers and other individuals who have lend a helping hand either directly or indirectly. I also would like to thank Universiti Teknologi MARA, Ministry of Higher Education and Yayasan Sultan Iskandar Johor for the scholarship and financial support.

Last but not least, a trillion thanks to my mother, Selamah Ador, my late father, Mohammad Jafar Hamid, grandmother, Mastaliah Sulaiman, and family members, Farahidayu, Faradianam Edy Yuhanis and Amil Hatim for their unconditional support and understanding. All the hard work and sacrifices has finally paid off.

Salifairus bin Mohammad Jafar

15 July 2022

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