# PREPARATION AND CHARACTERISATION OF ETHYLENE VINYL ACETATE/NATURAL RUBBER/MENGKUANG LEAF FIBRE THERMOPLASTIC ELASTOMER COMPOSITES

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**UNIVERSITI SAINS MALAYSIA**
**2019**

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by

**FAIEZAH BINTI HASHIM**

**Thesis submitted in fulfillment of the**

**requirements for the degree of**

**Doctor of Philosophy**

**September 2019**

## ACKNOWLEDGEMENT

Bismillahirrahmanirrahim, in the Name of Allah; the Most Gracious, the Most Merciful.

First and foremost, all praises to Allah S.W.T for the blessing and giving me the light in the searching of the knowledge and also giving me the healthy mind and body to complete this PhD project.

To my supervisor, Prof Hanafi Ismail whom generously in giving advice and guidance throughout the project, allocate his precious time, keeping my progress on schedule and always keep motivate me to stay positive and energetic along this PhD journey, thank you so much. You are truly a motivator! My deep appreciations and thankfulness to my co-supervisor, Dr Arjulizan Rusli for your continual support, guidance and friendship.

Universiti Teknologi MARA (UiTM), and Ministry of Higher Education, of Malaysia, thank you for generously in giving the SLAB/SLAI award of sponsorship. Hopefully, this award of sponsorship can be continued every year in giving benefits to Malaysia citizens. To further extend my gratefulness, I would like to express my sincere gratitude to the School of Materials and Mineral Resources Engineering, Universiti Sains Malaysia (USM) for providing me adequate facilities, functional equipment and also a peacefully studied environment.

To my beloved mother; Salbiah binti Abdullah and my late dearest father, almarhum Hashim bin Abdul Rahim thanks for your love, kindness and teach me that to become a success, it comes with hard works. Thank you for all your prayers and love. To my mother in law, Siti Zainab bt Md Isa, and my late father in law, almarhum Awang bin Arifin thank you for your prayers and support.

To the other half of me, dearest husband, Mohd Fakrul Radzi bin Awang, you mean so much to me. Thanks for providing me unconditional love, emotional and moral support, thoughtful and you always with me.

To my kiddies, Filza Hannah, Fatihah Hana, Farha Hafiyya,and Firdhan Hafizh you are the reason, for me to keep strong in finishing this PhD journey. You are giving me a full of strength and also the eyewitness of my great effort to complete this PhD. I love you all.

My heartfelt appreciation to all of the lab technicians for their assistance in handling the instruments. I owe a great deal of appreciation and gratitude to Mr. Shahril Amir bin Saleh and Mr. Mohd Suharuddin bin Sulong (Rubber Lab), Mr. Mohammad bin Hassan (Plastic Lab), Mr. Mohd Faizal bin Mohd Kassim (Latex Lab), Mr. Abdul Rashid Bin Selamat and Mr. Muhammad Khairi Bin Khalid (SEM Lab) and Mr. Norshahrizol bin Nordin (Workshop) for their help and support during my experimentation in those laboratories. Besides, I would like to thank administrative and technical staff members of the SMMRE, USM who has been kind enough to advise and help in their respective roles. Your skills and knowledge of your expertise would become the University pride and success in becoming the top universities in the world.

I am indebted to my research group colleagues for providing a stimulating and fun filled environment. Many thanks go in particular to Dr Shazlin Bt Shaari,Dr Norshahida Bt Sarifuddin , Dr Ooi, Dr Pang Ai Ling, Dr Fasihah Zaaba and Dr Siti Zuliana Bt Salleh for their personal and scholarly interaction. To all my beloved friends, especially Dr Rosyaini, Dr Dalina, Nurul Aizan, Siti Nor, Nor Hafizah and, Zainathul Akhmar Salim who give their ears to listen to, their shoulders to cry on, and their hearts to care. Indeed, your willingness in sharing ideas, knowledge and skills are deeply appreciated.

Faiezah binti Hashim

September 2019

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| CR | Chloroprene Rubber |
| CV | Conventional System |
| DCP | Dicumyl Peroxide |
| DP | Degree of Polymerization |
| DTG | Differential Thermogravimetry |
| ENR | Epoxidized Natural Rubber |
| EPDM | Ethylene Propylene Diene Monomer |
| EPR | Ethylene Propylene Rubber |
| EV | Efficient System |
| EVA | Ethylene Vinyl Acetate |
| FTIR | Fourier Transform Infrared |
| HDPE | High-Density Polyethylene |
| LDPE | Low-Density Polyethylene |
| M100 | Tensile Modulus at 100% elongation |
| MLF | Mengkuang Leaf Fibre |
| NaOH | Sodium Hydroxide |
| NBR | Nitrile Rubber |
| NR | Natural Rubber |
| PHR | Part per hundred |
| PLA | Polylactic Acid |
| PP | Polypropylene |
| PS | Polystyrene |

| | |
|---|---|
| PVC | Polyvinylchloride |
| SEM | Scanning Electron Microscope |
| Tg | Glass Transition |
| TGA | Thermo Gravimetric Analysis |
| TPE | Thermoplastic Elastomers |
| TPV | Thermoplastic Vulcanisates |
| TPO | Thermoplastic Elastomeric Polyolefin |
| TPNR | Thermoplastic Natural Rubber |
| VA | Vinyl Acetate |

## LIST OF SYMBOLS

| | |
|---|---|
| kJ | KiloJoule |
| $g/cm^3$ | Gram per cubic centimeter |
| $^oC$ | Degree celcius |
| g/mol | Gram per mole |
| % | Percent |
| µm | Micrometer |
| g | Gram |
| mol | Mole |
| ml | Mililiter |
| min | Minute |
| rpm | Revolutions per minute |
| $cm^{-1}$ | Inverse centimetre |
| $^o$ | Degree |
| psi | Pounds per square inch |
| kN | KiloNewton |
| mm/min | Milimeter per minute |
| mm | Milimeter |
| h | Hour |
| mg | Miligram |
| $^oC$ / min | Degree celcius per minute |
| ml/min | Mililiter per minute |
| J/g | Joule per gram |
| ml/mol | Mililiter per mole |

| | |
|---|---|
| cm | Centimeter |
| $M_L$ | Minimum torque |
| $M_H$ | Maximum torque |
| $T_m$ | Melting temperature |
| ρ | Density |

**PENYEDIAAN DAN PENCIRIAN KOMPOSIT ELASTOMER TERMOPLASTIK ETILENA VINIL ASETAT/GETAH ASLI/SERAT DAUN MENGKUANG**

## ABSTRAK

Komposit elastomer termoplastik adalah sebatian ternari yang mengandungi termoplastik dan elastomer sebagai fasa matrik dan serat semulajadi sebagai fasa penyebar. Prestasi akhir sesuatu komposit diterangkan melalui gabungan antara serat semulajadi, matrik polimer dan interaksi antara serat dan matrik. Oleh itu, dalam kajian ini satu komposit elastomer termoplastik dihasikan berasaskan Etilena vinil astete (EVA), getah asli (NR) dan serat daun mengkuang (MLF).. Dalam siri pertama, turutan penyebatian yang terbaik telah dikaji untuk mendapatkan komposit dengan sifat-sifat yang terbaik. Nisbah EVA dan NR telah ditetapkan pada 50:50 manakala jumlah MLF adalah dalam lingkungan 0 hingga 10 phr (bahagian seratus resin). Didapati, peningkatan dalam sifat akhir komposit telah dicapai apabila EVA disebatikan dahulu dengan NR sebelum MLF dimasukkan. Sistem ini telah menghasilkan satu sistem komposit yang mempunyai penyebaran serat yang terbaik dalam matrik, dan menghasilkan penstabilan tork yang rendah, sifat-sifat regangan yang baik, dan kestabilan sifat termal jika dibandingkan dengan sistem yang dihasilkan melalui turutan yang lain. Dalam siri kedua, pengubahsuaian serat melalui kaedah rawatan pemutihan alkali peroksida telah dikaji. Rawatan ini didapati berkesan dengan menghilangkan bendasing pada permukaan, lignin dan hemiselulosa, sehingga menghasilkan permukaan serat yang lebih kasar yang membantu pelekatan serat/matriks yang lebih baik, seperti yang digambarkan oleh ujian imbasan elektron