

ADVANCES IN MATERIALS ENGINEERING

Volume 1

Edited By:
Zahurin Halim
Iskandar Idris Yaacob
Md Abdul Maleque



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Table of Content

Chapter 1 Preparation and Characterization of Thermoplastic Natural Rubber (TPNR) Nanocomposites <i>Noor Azlina Hassan, Sahrim Hj. Ahmad, Rozaidi Rasid and Norita Hassan</i>	1
Chapter 2 Polymer Clay Nanocomposites: Part I <i>Noor Azlina Hassan and Norita Hassan</i>	6
Chapter 3 Effect of Processing Parameters on the Tensile Properties of TPNR Reinforced Short Carbon Fibre Composite <i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>	11
Chapter 4 Effect of Maleic Anhydride Polyethylene on Damping Properties of HDPE/EPDM Nanocomposite <i>Hazleen Anuar, Nur Ayuni Jama, and Shamsul Bahri Abdul Razak</i>	16
Chapter 5 Comparative Study on the Effect of Plasticizer on Thermal Properties of Polylactic Acid <i>Hazleen Anuar and Muhammad Rejaul Kaiser</i>	22
Chapter 6 Quality of Copper Film Electroplated on Silicon Wafer Using Different Current Densities <i>Shahjahan Mridha</i>	28
Chapter 7 Laser Nitriding of Titanium <i>Shahjahan Mridha</i>	39
Chapter 8 Composite Coating on Titanium Alloy Using High Power Laser <i>Shahjahan Mridha</i>	45

Chapter 9	
Measurement of Moisture Absorption in Borophosphosilicate Glass (BPGS) Films	50
	<i>Shahjahan Mridha and Shiau Khee Tang</i>
Chapter 10	58
The Effect of Processing Parameter on Tensile Properties of Thermoplastic Natural Rubber Nanocomposites	
	<i>Noor Azlina Hassan, Sahrim Hj. Ahmad, Rozaidi Rasid and Norita Hassan</i>
Chapter 11	64
Comparison of Mechanical Properties Between Untreated and Sulphuric Acid Treated Short Carbon Fiber Reinforced Thermoplastic Natural Rubber (TPNR) Composite	
	<i>Noor Azlina Hassan, Norita Hassan, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 12	69
Water Absorption of TPNR Reinforced Short Carbon Fibre Composite	
	<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 13	74
Enhanced Tensile Strength with Sulphuric Treated Short Carbon Fibre	
	<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 14	79
Effect of Fibre Length on Tensile Properties of TPNR-Kenaf Fibre Composite	
	<i>Hazleen Anuar, Sahrim Hj. Ahmad and Rozaidi Rasid</i>
Chapter 15	84
Effect of Nanoclay on Mechanical Properties of PLA-Clay Nanocomposite	
	<i>Hazleen Anuar and Muhammad Rejaul Kaiser</i>
Chapter 16	90
Extraction of Glucose From Kenaf Core by Using Chemical Pre – Treatment Process	
	<i>Nurhafizah Seeni Mohamed, Hazleen Anuar, Maizirwan Mel, Rashidi Othman, Nur Aisyah Mohd Norddin, Nur Aimi Mohd Nasir, Mohd Adlan Mustafa Kamalbhrin</i>
Chapter 17	96
Wear of Nitride Coating Produced by Ti-Al Melt Synthesis in Nitrogen Environment	
	<i>Shahjahan Mridha</i>
Chapter 18	
Effect of Dispersant on Protein Foaming-Consolidation Porous Alumina Containing Hydrothermal Derived Hydroxyapatite Nanopowder	103
	<i>Iis Sopyan and Ahmad Fadli</i>

Chapter 19	109
Effect of Yolk Addition on Protein Foaming-Consolidation Porous Alumina-Calcium Phosphate Composites	
<i>Iis Sopyan and Ahmad Fadli</i>	
Chapter 20	115
Investigation of the Effect of Starch Addition on Protein Foaming-Consolidation Porous Alumina Containing Hydroxyapatite Nanopowder	
<i>Ahmad Fadli', Iis Sopyan, Nur Syahidah and Nur Nadia</i>	
Chapter 21	120
The Influence of Hydroxyapatite Loading on Protein Foaming-Consolidation Porous Alumina Sintered at 1300°C	
<i>Ahmad Fadli 'and Iis Sopyan</i>	
Chapter 22	126
High Density Polyethylene (HDPE) as an Alternative Material in Fuel Tank Production	
<i>Afiqah Afdzahuddin and Md Abdul Maleque</i>	
Chapter 23	132
Porous Alumina-Hydroxyapatite Composites via Protein Foaming-Consolidation Method: Effect of HA Loading on Physical Properties	
<i>Iis Sopyan, Ahmad Fadli and Nur Izzati Zulkifli</i>	
Chapter 24	137
Preparation and Characterisation of Low Density Polyethylene/Layered Silicate Nanocomposites	
<i>Salina Sharifuddin , Iskandar Idris Yaacob</i>	
Chapter 25	144
Effects of Sodium Dodecyl Benzene Sulphonate (NaDBs) on Li Imide-PMMA Based Solid Polymer Electrolyte	
<i>Fauziah Mohd Yusof and Iskandar Idris Yaacob</i>	
Chapter 26	149
Effect of Milling Time on Mechanochemically Synthesized Nanohydroxyapatite Bioceramics	
<i>Iis Sopyan, S. Adzila and M. Hamdi</i>	
Chapter 27	155
Morphological Analysis of Mechanochemically Synthesized Nanohydroxyapatite Bioceramics	
<i>Iis Sopyan, S. Adzila and M. Hamdi</i>	
Chapter 28	160
Sodium Doped Nanohydroxyapatite Bioceramics through Mechanochemical Synthesis	
<i>S. Adzila, Iis Sopyan and M. Hamdi</i>	

Chapter 29	165
Thermal Profile Analysis of Composite Brake Rotor	
<i>Md Abdul Maleque and Abdul Mu'min Adebisi</i>	
Chapter 30	172
The Effect of Fibre Content on Thermal Property of Coir Fibre Reinforced Cement-Albumen Composite	
<i>Faridatul Faezah Razali, Nur Humairah Abdul Razak and Zuraida Ahmad</i>	
Chapter 31	178
Pulsed Electrodeposition	
<i>Suryanto</i>	
Chapter 32	184
Electroless Nickel Based Coatings From Solution Containing Sodium Hypophosphite	
<i>Suryanto</i>	
Chapter 33	189
Characterization and Utilization of Fly Ash	
<i>Suryanto</i>	
Chapter 34	195
Workability of Coir Fibre- Reinforced Cement-Albumen Composite	
<i>Nur Humairah Abdul Razak and Zuraida Ahmad</i>	
Chapter 35	201
Preparation of Rice Husk for Raw Material of Silicon	
<i>Hadi Purwanto and Nor Fazilah Mohd Selamat</i>	

Effect of Maleic Anhydride Polyethylene on Damping Properties of HDPE/EPDM Nanocomposite

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Keywords: Dynamic mechanical analysis, maleic anhydride polyethylene, polymer blends, organophilic montmorillonite, nanocomposite.

Abstract. Polymer alloy or polymer blend is a technology to compound polymers, additives and fillers for varieties of applications. In this project, the main key is to develop high density polyethylene (HDPE)/ethylene propylene diene monomer (EPDM) blend and OMMT filled HDPE/EPDM nanocomposite. The effect of compatibilizer agent and 4 vol% organophilic montmorillonite clay (OMMT) on dynamic mechanical analysis (DMA) was investigated. Both HDPE/EPDM blend and OMMT filled HDPE/EPDM were first prepared via intercalation technique at 4 vol% OMMT content. In the current study, maleic anhydride polyethylene (MAPE) was applied as compatibilizer agent. The effectiveness of MAPE agent was then compared with control one and analyzed based on dynamic mechanical behaviour and field emission scanning electron microscope (FESEM) examination. DMA test revealed that MAPE agent along with the addition of 4 vol% OMMT had attained the highest increased in both storage modulus, E' and $\tan \delta$, δ values as compared to the control system. This is evidenced by the finer surface and less formation of void with MAPE agent.

Introduction

Nanotechnology means building things from the bottom up, with atomic precision [1]. Polymer layered silicate (PLS) is also classified as hybrid materials which composed of organic polymer matrix in which inorganic particles with nanoscale dimension are embodied [2-4]. While polymers are light weighted, conformable, flexible, and easy to process, they remain relatively poor in thermal, mechanical, optical and electronic performances.

On the other hand, inorganic materials usually exhibit good physical properties but are heavy, rigid and difficult to process. By nanosizing an inorganic material and dispersing it into a polymer to make polymer layered silicate (PLS), it is possible to utilize the merits of both materials [5-7]. Different types of fillers are utilized for the preparation of nanocomposites. Amongst these, the most common is a nano clay called montmorillonite (MMT), a layered smectite clay.

The current study focused on the dynamic mechanical analysis or DMA. DMA is a tool commonly used to study the material responses toward stress, temperature and frequency. DMA measures stiffness and damping, which are reported as modulus and $\tan \delta$. In the current study, DMA was performed in order to study the effect of compatibilizer agent along with the addition of 4 vol% organophilic montmorillonite clay (OMMT) on the storage modulus, E' and tangent delta, δ of both high density polyethylene (HDPE)/ethylene propylene diene monomer (EPDM) blend and OMMT filled HDPE/EPDM.