UNIVERSITI TEKNOLOGI MARA

THE EFFECT OF HECTORITE CLAY ON THE PREPARATION OF PS-*g*-PAA/HECTORITE CLAY AND MUNG BEAN STARCH SUPERABSORBENT POLYMER COMPOSITE

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science
(Polymer Science and Technology)

Faculty of Applied Sciences

April 2019

ABSTRACT

A series of novel Superabsorbent Polymer Composites (SAPCs) were prepared through emulsion polymerization technique based on partially neutralized Acrylic Acid (AA) (AA was neutralized until PH 6) grafted onto polystyrene chain in the presence of mung bean starch and Hectorite clay powder as the reinforcement. In this study, N'N'-Methylenebisacrylamide (NMBA), Ammonium Persulphate and Span 60 was used as a crosslinker, initiator and dispersant respectively. Swelling, thermal, morphology and mechanical properties of the SAPC were determined in this study. Swelling analysis was carried out in distilled water. The swelling equilibrium analysis and types of water diffusion was observed. The effect of acrylic acid, crosslinker, initiator, starch and hectorite clay on the water absorbency was identified. Based on the swelling analysis, the composite containing 0.4 g hectorite clay has the optimum water absorbency with the water uptake of 48.76 g/g. Meanwhile, swelling equilibrium shows all the samples achieved equilibrium in 2 hours and types of diffusion for the SAPC followed both fickian and non-fickian diffusion. The FTIR analysis confirmed that the grafting polymerization took place among acrylic acid, polystyrene, mung bean starch and Hectorite clay by the presence of new ester peak on the spectra. In the Thermal Gravimetric Analysis, the addition of hectorite clay in the sample resulted in the increasing of the decomposition temperature of the sample at the maximum weight loss from 372°C to 381°C indicated that the SAPC has a good thermal stability. Lastly, the morphological analysis using Scanning Electron Microscopy (SEM) shows that the mung bean starch and hectorite clay particles were dispersed in the composite, thus providing a good interaction between the starch, clay particle, and polymer chains.

ABSTRAK

Satu siri terbaru Komposit Polimer Super Resapan (KPSR) telah dihasilkan menggunakan teknik pempolimeran emulsi berasaskan asid akrilik separa neutral (asid akrilik dineutralkan sehingga PH 6) yang ditambahkan kepada rantaian polistirena dengan kehadiran kanji kacang hijau dan serbuk "*Hectorite clay"*sebagai pengukuh. Dalam kajian ini, N, N'-Metilenebisakrilamida (NMBA), Ammonium Persulfat (APS) dan Span 60 masing-masing digunakan sebagai pengikat, pemula dan penyebar. Ciri-ciri pengembangan, termal, morfologi dan mekanikal telah dikenalpasti dalam kajian ini. Analisis pengembangan telah dilakukan di dalam air suling dan analisis keseimbangan pengembangan dikaji. Kesan kepelbagaian jumlah asid akrilik, NMBA, APS, kanji dan tanah liat hektorit terhadap penyerapan air dikenalpasti. Berdasarkan analisis pengembangan, komposit yang mengandungi 0.4 g tanah liat hektorit mempunyai penyerapan air yang paling optima iaitu 48.76 g/g penyerapan. Daripada analisis keseimbangan pengembangan pula, semua sampel mencapai keseimbangan dalam masa 2 jam dan jenis resapan untuk KPSR mematuhi kedua-dua resapan Fickian dan bukan Fickian. Sampel-sampel kemudiannya dicirikan menggunakan *Analisis Spektrum Inframerah Red (FTIR).* Analisis FTIR mengesahkan bahawa cantuman pempolimeran berlaku antara asid akrilik, polistirena,kanji kacang hijau dan tanah liat hektorit dengan kehadiran puncak gelombang ester di spektra tersebut. Dalam*Analisis Termogravimetri (TGA),* penambahan tanah liat hektorit ke dalam sampel meningkatkan suhu penguraian sampel pada pengurangan berat yang paling maksimum daripada 372°C kepada 381°C menunjukkan bahawa KPSR mempunyai kestabilan termal yang tinggi. Selain itu, analisi morfologi menggunakan *Mikroskop Imbasan Elektron (SEM)* menunjukkan bahawa zarah kanji kacang hijau dan hektorit telah tersebar dengan sekata dalam komposit, menunjukkan terdapat interaksi yang baik antara zarah kanji,tanah liat dan rantaian polimer.

ACKNOWLEDGEMENT

For the first and foremost, I wish to Allah S.W.T, the Almighty, the Benevolent for giving me the opportunity and strength to complete my long and challenging MSc research journey successfully. Then, I would like to extend my gratitude and appreciation to my main supervisor, Dr. Ahmad Zafir Romli and Co-supervisor, Madam Nur Raihan Mohamed for encouraging, guiding and supporting me with brilliant ideas from the beginning until completing this research.

My appreciation goes to Kementerian Pengajian Tinggi Malaysia for providing me a short term grant as financial support to do research. Besides, I would also like to extend my special thanks to the Laboratory Technician in UiTM especially Mr. Muhamad Faizal Abd Halim and UniMaP laboratory staff who provided the facilities and assistance during sampling and special thanks to my colleagues and friends for helping me in doing my research.

Lastly, I dedicated this thesis to my father, Deraman bin Mohd Noor and to the loving memory of my very dear late mother, [redacted] for their support and vision to educate me. This piece of victory is dedicated to both of you. Alhamdulillah.

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