SYNTHESIZE AND CHARACTERIZATION OFINTERPENETRATING POLYMER NETWORK (IPN) BASE ON PVA/PAAM

MOHD AFNAN BIN AZMI

Final Years Project Report Submitted In
Partial Fulfillment of the Requirement for the
Degree of Bachelor of Science (Hons.) Polymer Technology
in the Faculty of Applied Sciences
Universiti Teknologi MARA

MAY 2009

ACKNOWLEDGEMENTS

In the name of Allah s.w.t the most beneficent and most merciful. All praise is due to God. It is deepest sense of gratitude of the Al-Mighty Allah who gives strength and ability to me to complete my thesis report. Firstly I would like to thank to my supervisor, Pn Radin Siti Fazlina Nazrah Hirzin for her continues advice, guidance, encouragement, constructive comment and suggestion during every phase of this project until its completion. I also deeply indebted to Assosiate Prof Dr. Dzaraini Kamarun as my second supervisor for giving me the idea supported me during I doing this final years project. They have perpetually given moral support. I also would like extend my gratitude and appreciation to all polymer technology lecturers and the laboratory assistant especially to Mr Anuar, Mr Joe for cooperation during me doing final year project. Beside that I would like to opportunity to my family for their moral and financial support because they have indirectly help me complete my thesis. Thank to my fellow friends for all help and support during I doing this thesis. Thank you very much may Allah bless all of you.

Mohd Afnan Bin Azmi

TABLE OF CONTENT

ABSTRACT

SYNTHESIZE AND CHARACTERIZATION OF INTERPENETRATING POLYMER NETWORK (IPN) BASE ON PVA/PAAM

Interpenetrating polymer networks (IPNs) are a new class of polymer blend in network form in which at least one component is polymerized and or crosslinked in the immediate presence of the other. For this project, Sequential polymerization is used to prepare IPN sample between Acrylamide (AAM) and Polyvinyl Alcohol (PVA). Trimethylol propane triacylate (TMPTA) as a crosslinking agent and Potassium Persulfate (K_2SO_8) as initiator. The polymerization process had been done in the nitrogen gas. The variation compositions of PVA were prepared to determine the effect of PVA on PAAM/PVA IPN sample. Structural characterization of the PAAM/PVA IPN sample was investigated by Fourier Transform Infrared (FTIR). Increasing the percentage of PVA, the OH bond also increase. Differential Scanning Calorimeter (DSC) was used to study thermal properties such as glass transition temperature and melting temperature. In PAAM/PVA IPN sample, increasing the percentage of PVA increased the glass transition temperature. This is due to reducing segment mobility of PAAM/PVA IPN sample. The Thermo Gravimetric Analysis (TGA) was used to study the thermal properties of the PAAM/PVA IPN sample. Increasing the percentage of PVA in the PAAM/PVA IPN sample increased the thermal stability of sample due to increasing the degradation temperature at first stage. Gel content of PAAM/PVA IPN samples were determined by Soxhlet extraction process. Increasing the percentage of PVA will increase the physical crosslink in PAAM/PVA IPN sample, thus reduce the soxhlet ratio. Swelling test was done to investigate the water absorption properties of PAAM/PVA IPN sample. Increasing the amount of OH group in IPN sample increased the swelling of PAAM/PVA IPN sample. From the result, PAAM/PVA IPN sample with 0.2 mole PVA is the optimum value because it gives good result for all testing.

CHAPTER 1

INTRODUCTION

1.1 Background

Interpenetrating polymer networks (IPNs) are a combination of two or more polymer networks synthesized in juxtaposition (Sperling *et al.,* 1981).They can also be described as polymer networks held together by permanent entanglements. The networks are held by topological bonds, essentially without covalent bonds between them. By definition, an IPN structure is obtained when at least one polymer network is synthesized independently in the immediate presence of another. IPNs are an important class of materials attracting broad interest from both fundamental and application points of view (Bischoff *et al.,* 1999).

Interpenetrating polymer networks (IPNs) are a new class of polymer blend in network form in which at least one component is polymerized and or crosslinked in the immediate presence of the other (Sperling *et al.,* 1981). IPNs process several interesting characteristic in comparison to normal polyblends, because of varies synthetic techniques yield IPNs of such diverse properties that their engineering potential span a broad range of modern technology (Sperling *et al.,* 1981).

These polymer are closely related to other multi component material, containing completely entangle chains, such as polymer blends, graft and block. But, the