CHAPTER I

INTRODUCTION

1.1 The Purpose of the Investigation

Natural rubber latex is the form inwhich rubber is extruded from the *Hevea brasilliensis* tree as an aqueous emulsion, as rubber and non-rubber particles dispersed in an aqueous serum phase. Natural rubber latex is present in a range of plants. The rubber tree is truly considered to be the important commercial source of the polymer cis-polyisoprene[1]. Nonetheless, many attempts have been made to modify this rubber. The backbone unsaturation makes certain types of chemical modification relatively easy. Moreover, natural rubber is a resource of Thailand that has high potential of production during each year. However, at present, the export of ribbed smoke sheet rubber and block rubber has had the tendency to decrease.

Therefore, it is extremely necessary to find a new approach to use more natural rubber products. In this research, the prevulcanized natural rubber latex reinforced with thermoplastic was produced by emulsion polymerization process. This experiment was designed to yield prevulcanized natural rubber latex-based latex interpenetrating polymer networks (IPNs) and semi-IPNs, inwhich the secondary component is polymethyl methacrylate (PMMA).

Since ethylene propylene diene monomer (EPDM)[2] and polyolefin elastomer (ENGAGE) are expensive and imported from abroad, using

prevulcanized natural rubber latex in replacement of EPDM as an impact modifier should help to reduce the capital of production. This product is expected to act as an impact modifier because it has hard segment of polymethyl methacrylate, and elastomer segment of prevulcanized natural rubber latex. Currently, EPDM is used as an impact modifier of polypropylene (PP), which is used as bumper. This investigation was concerned with the preparation of impact modifier from prevulcanized natural rubber latex-polymethyl methacrylate interpenetrating polymer networks by emulsion polymerization. Many different parameters such as the initiator, crosslinking agent and emulsifier concentrations, reaction time and temperature were taken into account. Furthermore, the morphology and mechanical property of IPNs and the blends of IPNs product and PP were studied.

1.2 Objectives

The objectives of this research are as the followings:

1. To prepare prevulcanized natural rubber latex - polymethyl methacrylate composites by means of emulsion polymerization method. The effect of such influential parameters as the concentrations of initiator, crosslinking agent, emulsifier agent, reaction time and temperature will be studied.
2. To characterize the morphology and mechanical properties of the resulting prevulcanized natural rubber latex - polymethyl methacrylate composites.
3. To prepare the blends of the composite products and EPDM with PP and to investigate the mechanical properties of the blends as an impact modifier for PP.
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1.3 Scope of the investigation

The appropriate conditions for the preparation of the prevulcanized natural rubber latex - polymethyl methacrylate composite were studied. The suitable ratio of prevulcanized natural rubber latex and polymethyl methacrylate, which yielded the best mechanical properties, was determined. The investigation procedures were carried out as follows:

1. Literature reviews
2. Experimental design

3. Preparation of the prevulcanized natural rubber latex - polymethyl methacrylate composites by mean of emulsion polymerization method. The appropriate reaction conditions were determined by changing the following parameters:
   3.1 The optimum concentration of the initiator/activator, crosslinking agent, emulsifier.
   3.2 The effect of reaction temperature and time.
4. Investigation on the effect of parameters on the degree of monomer conversion.
5. Characterization of the morphology of the resulting interpenetrating polymer networks by transmission electron microscopy (TEM) and scanning electron microscopy (SEM).
6. Determination of the mechanical properties such as tensile strength, impact strength, flexural strength, hardness.
7. Evaluation of the miscibility between components of polymer blends by differential scanning calorimetry (DSC).
8. Investigation on the stability of products by thermogravimetric analysis (TGA).
9. Blending of the composite product with PP. The mechanical properties such as tensile strength, impact strength, flexural strength, hardness will be investigated.
10. Summarization of the results.