CHAPTER V

CONCLUSIONS AND SUGGESTIONS

Conclusions

5.1 Preparation of grafted natural rubber

Natural rubber (NR) latex were modified by graft copolymerization with MMA monomer. The effects of reaction temperature, MMA concentration, and rubber concentration on graft copolymerization were investigated. The results are summarized as follows:

1) In the graft copolymerization of NR, the percentage of grafted natural rubber decreased with increasing MMA content, but percentage of free rubber and free PMMA increased with increasing MMA content.

2) The appropriate conditions of garft copolymerization were at latex concentration of 30%, reaction time of 6 hr., temperature of 40°C, which gave the highest percentage of grafted natural rubber of 96.00 and 88.38 for the MMA content was 20, 40 phr, respectively. The percentage of conversion increased with increasing reaction time.

3) The grafted natural rubber was characterized by FTIR, TGA and DSC. The decomposition temperature was between 370-390°C and glass transition temperature appeared a deflection at -64°C. The appearance of new peaks in the FTIR spectrum of NR-g-MMA was at around 1735 cm^{-1} and 1148 cm^{-1}, due to the carbonyl group in PMMA grafted on NR backbone.

5.2 Properties of Blends

1) Effects of the different GNR types on the cure characteristics and physical properties were investigated. The minimum torque, maximum torque, scorch time and cure time increased with increasing the MMA content. Contrastly, the cure rate index (CRI) decreased with increasing the MMA content. For gum compounds, the 300% modulus, hardness, tear strength and oil resistance increased with increasing the MMA content. But the elongation at break decreased with increasing the MMA content.

2) Effects of GNR types in GNR/PVC blends on physical properties were studied. The compounds from mixing on two-rolls mill were compressed and cut into the specific shape as specimens. The properties measured were 300% modulus, tensile strength, elongation at break, tear strength, hardness, oil resistance and abrasion resistance. The results are summarized as follows:

3) The 300% modulus, tear strength and oil resistance increased with increasing the PVC content. For PVC blended with the different GNR types, these properties were improved by GNR with high MMA content.

4) Tensile strength and elongation at break decreased with increasing PVC content. For GNR/PVC blends with PVC content above 60 phr, these properties increased with increasing the PVC content..

5) Oil resistance of GNR/PVC blends increased with increasing the PVC content. For GNR/PVC blended with different GNR types, these properties increased with increasing the MMA content. Taber abrasion resistance of GNR/PVC blends decreased with increasing the MMA content in GNR.

From this work, the blend of GNR-60 and PVC-P20 at ratio of 80:20 yielded good physical properties. The properties are as follows:

Tensile strength	22.0	MPa
300% Modulus	20.9	MPa

Elongation at break	323	%
Tear strength	59.7	N/mm
Hardness	94.7	IRHD
Abrasion resistance (Taber abrader type)	0.237	cm^3/2000 cycles

Suggestions

In the area of modification of natural rubber latex and polymer blends, it should be studied further in the following aspects:

1. To modify the NR by adding other vinyl monomers such as styrene-co-methyl methacrylate.

2. To study the parameter of mixing of GNR/PVC blends in order to improve the rheological behavior, physical properties and morphology of blends.

3. To study the properties of the recycling of GNR/PVC blends.

4. To study the effects of the fillers such as carbon black, silica, calcium carbonate, etc. on the physical properties of GNR/PVC blends.

5. To study the physical properties, rheological behavior and morphology of unvulcanized GNR/PVC blends and compare with vulcanized GNR/PVC blends.