



CHAPTER V

CONCLUSION AND RECOMMENDATION

The graft copolymerization of methyl methacrylate (MMA) onto natural rubber (NR) latex induced via microwave irradiation could be efficiently achieved within a very short reaction time in the presence of small amount of redox initiator. In contrast, the conventional grafting method not only required redox initiator but also took a longer reaction time indicating relatively less efficiency. In efforts to work toward clean green chemistry, microwave can be a very useful tool for the grafting of MMA onto NR (NR-g-MMA).

5.1 Statistical analysis using two level factorial design experiment

The sequence of the main effects of the variables on the %grafting properties and %GE for graft copolymerization of MMA onto NR latex by using a 2^4 factorial experimental design was the monomer concentration (MMA) > microwave power (MWP) > initiator concentration (INT) > exposure time (ET). Moreover, the two-factor interaction effect between MMA and MWP was significant for the %GNR and %free NR. The %GNR was dramatically influenced by the amount of MMA. The %GNR decreased with increasing the initiator loading resulting to enhance the poly(methyl methacrylate) (PMMA)-homopolymer content. The exposure time did not influence on the %grafting properties and %GE over the range of study.

5.2 Univariate experiment for graft copolymerization

The graft copolymerization of the MMA monomer onto NR induced via microwave irradiation using cumene hydroperoxide/tetraethylene pentamine (CHPO/TEPA) as the redox initiator was carried out by varying the microwave power, exposure time, monomer and initiator concentrations. %GNR and %GE tended to increase when 0.5-1.0 phr of initiator concentration and 25-40 phr of monomer concentration were applied to the reaction system under 75-100 W of

microwave power at 60°C within 20 min. Under these reaction condition, %GNR and %GE were in the range of 58.3-79.7% and 51.3-76.8%, respectively. The more severe reaction condition caused the reduction of %GNR and %GE possibly due to the termination via recombination effect of the free radicals and decomposition of initiator and monomer including the graft product; especially, under the high microwave power and long exposure time.

5.3 Morphology of GNR

From transmission electron microscopy (TEM) micrograph, the grafted latex obtained from the microwave induced graft copolymerization of MMA onto NR (76.8 %GE) consisted of NR particles with a core-shell morphology.

5.4 Recommendations

A further study of the graft copolymerization should be concerned with the following aspects:

1. By applying the microwave grafting method for graft copolymerization of other polar monomers such as ethyl methacrylate (EMA), butyl methacrylate (BMA), acrylonitrile (ACN), vinyl acetate (VA) etc. onto NR or diene elastomers.

2. Application of obtained GNR as a compatibilizers for polymer blends having polarity difference e.g. fluorocarbon rubber (Viton) and NR.