CHAPTER V
CONCLUSIONS

The results show that the percentage of styrene monomer affected the molecular weight of the polymer product. According to Guo, El-Aasser, and Vanderhoff (1989), higher monomer concentrations lead to higher molecular weights. One possible explanation for the observed behavior is that there are more available monomers for polymeric growth in the propagation step. These available monomers are contained in the microemulsion. However, the monomer variable was varied in a small change of only 5% in this study. This indicates that the maximum molecular weight is a strong function of other variables and not only of monomer concentration. Stable solubilization of the polymer is one limiting process.

Coutinho and Martin (1991) studied the effect of the surfactant poly(ethylene oxide) PEO on molecular weight. They reported that the increase in the concentration of PEO (10 to 40 mol/l) provoked increased formation of the primary radicals and so the molecular weight decreased (8.67×10^5 to 3.19×10^5). Similarly, in this study, the higher NaDEHP concentration (0.5 to 1.5 mmol/l) slightly reduced the molecular weight (1.03×10^6 to 9.87×10^6) with 4 or 100 watt UV lamp. It should be pointed out that, under these circumstances, the higher the NaDEHP concentration, the higher the amount of micelles. Since the monomer concentration was fixed, there was less amount of monomer contained in the micelles at increased NaDEHP concentrations. Thus, low molecular weight product was obtained. Furthermore, the NaDEHP concentration in all events reached the highest molecular weight at the same time (200 min, and 25 min in the case of 4 watt, and 100 watt). This would lead to the conclusion that in general NaDEHP concentration did not have a strong effect either.

The radiant power of UV lamp is one of the main factors in the photopolymerization. The molecular weight of the polymeric product depended upon the radiant power of lamp and also the exposure time. 100 watt UV lamp induced rapid polymerization. Abu-Abdoun and Aale-Ali (1993) reported that the light intensity can affect the polymerization rate. Corresponding to their study, 100 watt UV lamp data achieved the highest molecular weight at the much shorter time than a 4 watt UV lamp. Moreover, a 100 watt UV lamp also induced decomposition of the product.

Recently, there have been many literature reports on PDIs using different techniques. However, their PDIs were broader than this work. 3.8-5.7 PDI (Gua et al., 1989) was observed by using SDS microemulsion polymerization technique using either KPS or ABIN as initiator. Arenesulfonyl chlorides and $Cu(bpy)_nCl$ were used to initiate the polymerization (Percec and Barboiu1995). A polymer with PDI of 1.6 was obtained. Comparing this PDI result with the previous works, the PDIs were in relative narrow molecular weight distribution (1.4-1.6). As a result the microemulsion technique yielded high molecular weight polymers with a narrow molecular weight distribution. This type of synthesis can therefore be useful for commercial production.

Recommendation

Due to the time constraints, the physical chemistry of microemulsion solutions and the kinetics of polymerization could not be fully characterized. Future studies are needed to understand the reasons for the limiting values of the molecular weights and the polydispersity index.