CHAPTER V

CONCLUSION

Poly (phenyl vinyl ketone) with the glass transition temperature (Tg) of 87-88 °C and with different molecular weight were synthesized by starting from β-dimethylaminopropiophenone hydrochloride. Among these, poly (phenyl vinyl ketone) with molecular weight about 181,000 and 33,000 were selected for mixing with HDPE film.

Photodegradation of HDPE films both with and without PPVK were studied under natural and accelerated weathering, i.e. by outdoor exposure and irradiation with medium pressure mercury lamp, respectively. Determination of molecular weight via viscosity measurement was used for monitoring the degradation of HDPE film. It was found that the degradation of HDPE films both with and without PPVK proceeded gradually in the first 2 weeks of outdoor exposure, though HDPE film with PPVK degraded a little faster than the one without PPVK. After 8 weeks, molecular weight decreased to 50% of the original one. Concurrently, the carbonyl and vinyl groups appeared during the weathering as revealed by FTIR spectroscopic method.

Under the accelerated weathering, the molecular weight of HDPE films with and without PPVK sharply diminished, faster than the ones under the outdoor exposure due to the higher intensity of UV light from mercury lamp. The degradation of HDPE films containing PPVK was, again, faster than the one without PPVK. It indicated that PPVK could accelerate the photodegradation of HDPE and the action of PPVK was concentrated mainly in the first

stage (the first 16 hours). The degradation tended to reach a gradual saturation at the last stage of irradiation. With regard to the concentration of PPVK in HDPE film, the higher the concentration, the faster the degradation and the distinct difference was observed between the HDPE films with 0% and 1.0% PPVK. However, the certain amount of PPVK added to HDPE film should be considered for the commercial use. At this point, more studies should be conducted.

When different thickness of HDPE films were compared, it was found that the thinner the thickness, the faster degradation occurred. Because the UV light reached only the shallow parts under surfaces, so that the crosslinking reaction, which gave insoluble material in the case of the thicker film, occurred in the bulk of samples. Photodegradation also caused the discoloration at the film surfaces. However, the molecular weight of PPVK (about 181,000 and 33,000) did not affect on HDPE degradation. Actually, the high molecular weight may affect on dispersion because of the longer chain lengths. The higher entanglement will be and can lead to the formation of PPVK cluster in HDPE film. In this research, it was proved that PPVK with molecular weight of 33,000 dispersed evenly. It is thus promising that PPVK can be used as the photosensitizer to cause plastic photodegradation. This trend should be better than the utilization of low molecular weight compounds. However, the photodegradation of plastic should be studied more deeply in order to induce the degradation at the suitable time.