

CHAPTER 6



CONCLUSION

The polyethylene films, both LDPE and HDPE, were degraded by outdoor exposure and irradiation using medium pressure mercury lamp. In order to study the behavior of photosensitizer in polyethylene films how the degradation rate changes, six different photosensitizers were therefore used as following : aromatic ketones, such as benzophenone, 4-methoxybenzophenone, thioxanthone, and aromatic diketones, such as anthraquinone, 2-methylantraquinone, 2-tert-butylantraquinone. The photosensitizer was added to PE film in a concentration of 0.5 % by weight. All HDPE and LDPE films, 0.035 ± 0.005 mm. thickness, were exposed outdoor during 6 months and irradiated by using medium pressure mercury lamp. The sampling was interval period and then was stored in the dark until testing. The properties before and after irradiation were observed as follows : tensile strength, elongation at break, gel content, molecular weight by viscosity method and fourier transform infrared absorption. Changes in the physical and chemical properties of both LDPE and HDPE films were obtained. Then, the results of outdoor exposure and irradiation were compared. The degradation mechanisms for unsensitized and sensitized polyethylene are proposed on the basis of experimental results. The results are summarized as follows :

1. The degradation rate of unsensitized polyethylene films continuously proceeds in the first two-month exposure. After 2 months of outdoor exposure, the elongation at break and molecular weight of HDPE films are 50 % of the initial values. For LDPE ones, the elongation at break and molecular weight are 50 and 70 % of the initial values, respectively. It can be seen that the rate of degradation of HDPE is faster than that of LDPE,

regarding to the tensile properties.

2. The degradation behavior of unsensitized and sensitized polyethylene irradiated with medium pressure mercury lamp are similar to those under natural weathering. Changes of tensile strength and elongation at break take place suddenly after irradiation.

3. The molecular weight and elongation at break of sensitized HDPE under natural weathering and irradiation sharply deminished after exposure. The properties changes more rapidly than those of sensitized LDPE. The rate of degradation of sensitized polyethylene is higher than that of unsensitized one.

4. For different photosensitizers, polyethylene films sensitized with thioxanthone, derivatives of benzophenone and of anthraquinone show higher degradation rate than films sensitized with benzophenone and anthraquinone.

At present, there are more advances in the use of degradable plastics, but at the same time the steadily increasing proportion of plastics is now causing major problems of handling and disposal of domestics and industrial wastes. Thus, this work contributes a little to the solution of plastic waste problem by incorporating photosensitizers into plastics. When these plastics are exposed to UV light, their deterioration of properties of plastics started immediately. However, plastic degradation should be studied further in the aspect of

1. The effect of other types of photosensitizers
2. The behavior of multi-component sensitized systems
3. The optimum concentrations of photosensitizers