# CHAPTER 6

## CONCLUSIONS

To study the photodegradation process, the blow moulding PVC were exposed to natural weathering , in parallel with the accelerated weathering by using medium pressure mercury lamp. The effect of photosensitizer, that incorporated during processsing PVC was studied in the photodegradation process. The two photosensitizers were anthraquinone and benzophenone. The photosensitizer was added to the polymer seperately at the concentration 0.1 % , 0.5 % and 1.0 % by weight for outdoor exposure and 0.05 % , 0.1 % and 0.5 % by weight for accelerating exposure. The blow moulding PVC sheets, 1 mm. thickness, were exposed to outdoor weathering for 9 months and, app. 0.4 mm. thickness, irradiated with medium pressure mercury lamp for 240 hours. The photodegradation was followed by means of tensile properties, molecular weight by viscosity method , Ultra-violet absorption , Fourier Transform Infrared absorption and visual inspection.

The photodegradation mechanisms for both unsentisized and sensitisized blow moulding rigid PVC were investigated and illustrated in the experimental results. The results of degradation rate of both unsensitized and sensitized blow moulding PVC from the outdoor exposure and accelerating exposure test were compared and the effects of two types of photosensitizer were investigated. The results can be summarized as followed;

1. The photooxidation products consist mainly of carbonyl groups, hydroxyl groups and conjugated polyenes. These degradation products increased with exposure time as shown in Fig. 4.5-4.8 and 4.13-4.15 for carbonyl and hydroxyl groups and the increase in colour of the degraded polymers with exposure time in Fig. 4.9 and Fig. 4.17.

2. The changes in physical and mechanical properties of photodegraded blow moulding PVC can be clearly observed since the tensile strength and elongation at rupture tendencies will be increase at first and then decreased with exposure time because of the formation of the chain scissions and crosslinking structures. This formation not only had an effect in tensile properties but also in molecular weight decreasing and subsequent embrittlement of the photodegradation samples. Furthermore, the optical and surface of PVC sheets exposed to UV radiation are severly modified since both the hydrochlorination and the oxidation process develop primary in the top layer of the irradiation material by loss of gloss and transparency as well as colour formation.

3. The more photosensitizer added,the faster photodegradation proceeding as tested with the concentration range between 0.01 to 1.0 % by weight.

4. At the same concentration, anthraquinone is strongly sentisized in comparison with benzophenone.

Recommendation

Since the colour of the photosensitizer (anthraquinone) is yellow therefore it causes colour of the sensitizer PVC samples to be rather yellow. So it is not suitable for sensitized PVC to be used in the food packaging applications. One type of application of sensitized PVC may be the plastic mulch films for protection of important plants by covering the soil ( retaining soil humidity, suppressing weed , etc.).

Limitation

For the better result, it should be studied the effect of

photosensitizers on the photodegradation of unplasticized blow moulding PVC. But unplasticized PVC can not be processing due to its poor heat resistance property of PVC. Therefore, plasticizers have to be added to enable the test to be carried out.