



SYNTHESIS OF LOW DENSITY POLYETHYLENE BASED PHOTODEGRADABLE POLYMER COMPOSITE USING CINNAMON LEAF OIL

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Polymers are considered among the most important materials in science, technology and engineering these days. The chemical, medical, agricultural and packaging as well as many others are greatly dependent on a wide variety of polymers. Every year, around five hundred billion packaging items are used worldwide. Polymer packaging are difficult and costly to recycle after the usage and most end up on landfill sites where they take around three hundred years to degrade. Polymer packaging items are made of basic polymer materials and various other chemicals which are mainly toxic during the degradation process. That is certainly very harmful to the health and the environment. One solution is introduction of photodegradable polymers. Most of the photodegradable polymers are developed with the help of photosensitizers. The objective of this research is to produce Low Density polyethylene (LDPE) based photodegradable polymer composite using locally available cinnamon leaf oil. Cinnamon oil was used as photosensitizers. Cinnamon is presently cultivated in in Kalutara, Galle, Ambalangoda, Matara and Ratnapura areas in Sri Lanka. Cinnamon oil contained two main photosensitizers namely Eugenol and Cinnamaldehyde. High quality cinnamon leaf oil is an anti-bacterial powerhouse that is often used to neutralize odors and create a pleasant exotic scent. Cinnamon leaves were subjected to distillation to extract cinnamon leaf oil. FTIR spectrometer was used to identify the extracted product. LDPE and extracted cinnamon oil were mixed using laboratory scale mixing equipment by varying cinnamon oil concentrations form 2 wt%. to 10 wt%. Hydraulic press was used to prepare the test samples. Ultra Violet (UV) exposure test, tensile test, water absorption test, weight loss test and colour variations were observed during the testing period. Samples were exposed to 120 hours to UV. Tests were conducted every 24 hours period. Cinnamon oil containing samples experimentally showed the reduction of tensile strength and percentage elongation with increase of UV exposure time. Further, tensile strength and percentage elongation gradually reduced with increase of cinnamon oil concentration. Samples containing 10 wt%. cinnamon oil with LDPE showed the maximum tensile strength reduction, maximum percentage elongation, maximum water absorption and maximum weight loss properties. 10 wt%. cinnamon oil with LDPE sample showed the 22% tensile strength reduction, 88 % percentage elongation reduction, 98% water absorption and 1.2% weight loss after 120 hours exposure to UV. Samples at initial stage showed yellowish colour but by the time it turned out to be brownish in colour exposure to UV. According to these experimental results showed the clear indication of photodegradation of photosensitizer containing samples.

Newly developed LDPE based photosensitizer containing composite material can be used for the non-food packaging applications to minimize the environmental pollution.

Keywords: LDPE, Photodegradable, Cinnamaldehyde, Eugenol, Cinnamon oil