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Studies on the Mechanical Properties of LDPE with 1% Benzophenone mixed various formulation of Maleic Dextrose

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Abstract : LDPE was blended with 1% Benzophenone and Maleic Dextrose (MLD) at various proportions of 5-30 by wt % as a additive using a twin screw extruder. Tubular blown film was extruded using blown film extruder. LDPE with Maleic dextrose was process able into 50 micron thickness in the temperature range 150 to 210ºC. It was observed that higher the Maleic dextrose content, lower the processing temperature range. All the formulations made using Maleic dextrose were easy for processing was decreased as the Maleic dextrose content increased. The film obtained was of light- yellowish brown color with smoothness appearance. The additive has been study about the mechanical properties in this paper. Future, the mechanical properties results will be study for the purpose of photo and biodegradable plastics.
Keywords : LDPE, Benzophenone, Maleic Dextrose, Mechanical properties.

Introduction

Plastics waste management remains a major environmental issue due to over population and rapid economic development. The complete degradation of plastics mainly polyethylene remains a challenge and the current work is focused on enhancing the biodegradation of polyethylene. The photodegradation followed by biodegradation of PE could be enhanced by the use of bio-based additives [1-10]. The photodegradation of a polymer and the effect of iron and calcium stearate was evaluated using different techninique. The growing use of plastics in agriculture has enabled farmers to increase their crop production. One major drawback of most polymers used in agriculture is the problem with their disposal, following their useful lifr-time[11-16]. Non degradable polymer, being resistive to degradation (depending on the polymer, additive, conditions etc) tend to accumulate as plastics waste, n of n of the soil and polluticreating serious problem of plastic waste management [17-22]. In case such as plastic waste ends up in landfills or it is buried soil, question are raised about their possible effect on the environment, Whether the biodegrade at all and if they do, what is the rate biodegradation and what effect the product of biodegradation have on the environment, including the effect of

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the additive used. Possible degradation of agricultural plastic waste should not result in contamination of the soil and pollution of the environment [23-26] in this research work low cost material additive incorporated in the polymer to produce to improve the degradation of polymer as per standradard.

Material & Experimental

LDPE- Extrusion grade 1020 FA20; (MFI: 2 g/10 min) Trade name- Indothene-IPCL, Vadodara, India. Benzo phenone from S.D Fine Chemicals, Chennai. Maleic dextrose prepare from 1 mole maleic acid and 1mole of dextrose with conc. Sulfuric acid to form Maleic dextrose from Sanjana Chemicals, Tambaram, Chennai. Compounding of LDPE with Maleic dextrose, 1% benzo phenone as a photo and biodegradable addditive was done in a twin screw extruder (Berstorff, High Performance Co-rotating Twin Screw Extruder, FRG). A Maleic dextrose and 1% benzophenone at a temperature range of 130ºC to 190ºC. The extrudate was cooled in a water trough, granulated and kept for natural drying.

LDPE-Maleic dextrose extruded films were having thickness of 50 microns. From this film sheet samples were made by cutting or punching. Tensile strength was measured using Universal Testing Machine (UTM) – INSTRON 3382. The specimens were cut as per ASTM D 882 specifications; length – 150 mm, width – 25 mm and thickness – measured from each specimen.

Table 1 Tensile properties of LDPE with Maleic dextrose and 1% benzophenone

Sl. No.	Description	Tensile Strength (Kg/cm²)		Elongation at Break (%)	
		Machine Direction	Transverse Direction	Machine Direction	Transverse Direction
1	LDPE	16	15	44	37
2	LDPE + 5% Maleic dextrose	15	13	39	29
3	LDPE + 10% Maleic dextrose	13	11	36	28
4	LDPE + 15% maleic dextrose	12	10	34	26
5	LDPE + 20% maleic dextrose	10	9	30	24
6	LDPE + 30% Maleic dextrose	10	9	28	10

Results and Discussion

Tensile Strength and Elongation

Tensile strength was found to be in the decreasing order with the increase in percentage of Maleic dextrose in both the machine and transverse directions. The LDPE maleic dextrose film sheet have better tensile strength in the machine direction (MD) than that in the transverse direction (TD). The same trend was observed in case of percentage of elongation also. Similarly the elongation at break in MD is higher than that of TD. In the MD the polymer orientations are parallel to the tensile forces whereas in the TD it is perpendicular one. Hence less strength and less elongation were obtained in the transverse direction.

This shows the weakening of mechanical properties which will improve the degrading nature of the modified polymers. LDPE-MLD (maleic dextrose) has a minimum elongation at break for the 30 percent formulation and was still flexible.

Conclusion

The mechanical properties like tensile strength and elongation at break were lowered with increasing the percentage of maleic dextrose with 1% benzoquinone. The mechanical properties of decreasing the strength level so the additive it will be used for the purpose photo and biodegradable additive. The additives The extrudate in the form of strands from the twin screw extruder was found to be stronger with less flexibility.

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