QUALITY ENHANCEMENT OF PLASTICS RECYCLED BY INCORPORATING LUBRICANT ADDITIVES

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INTRODUCTION

In the recent years, plastics waste has become a major problem to the environment. In Malaysia, the plastics refuse contain 100 grams per kilogram of total refuse (1). The plastics consumption also increases 10% every year that will make the problem worse (2). The primary sources of plastics waste come from the resin producer, the processor and fabricator and the consumer. Obviously, the best way to dispose plastics waste is to recycle it as a new meterial. The presence of recycled resin would not only reduce the demand of oil and natural gas as feedstock, but would also reduce energy consumption needed to produce a corresponding quantity of resin by polymerization. However, the major problem that often occurs during recycling is to maintain its quality as a new material. One method to solve the problem is to incorporate additives such as lubricant's additive to raise the recycle to a new level of value, sometime even above that of the original material(3).

MATERIAL AND METHODS

The material used in this work were a virgin High Density Polyethylene (HDPE) and Calcium Stearate as an additive. First study concerned about the degradation of HDPE through the processing using injection moulding and extruder. Second by the raising the quality of HDPE recycled by incorporating the lubricant additive. Percentage Calcium Stearate used were 0.1%, 0.3%, 0.5%, 0.7% and 0.9% by weight. Recycled HDPE was obtained by injecting, granulating and injection again. Tensile properties were used to determine the quality of the material and the method used was BS2782:320B.

RESULTS AND DISCUSSION

The processing of HDPE by injection moulding and extrusion has caused the degradation of the material property. Figure 1 and 2 shows the decreasing value of physical properties of HDPE. The decreasing properties are shown by the tensile strength and the elongation at break. This phenomena occur because of the thermal and mechanical effect on the polymer chain that cause the chain breakage during the processing.

Figure 3 and 4 shows the results of incorporating calcium stearate as a lubricant into the HDPE. The results indicate that by adding calcium stearate, tensile strength and elongation at break properties were increased. It is also observed that for calcium stearate content of 0.5% and above, all the physical properties have been improved, even better than the virgin HDPE.

Figure 1:
Tensile Properties of HDPE at Different Type of Processing

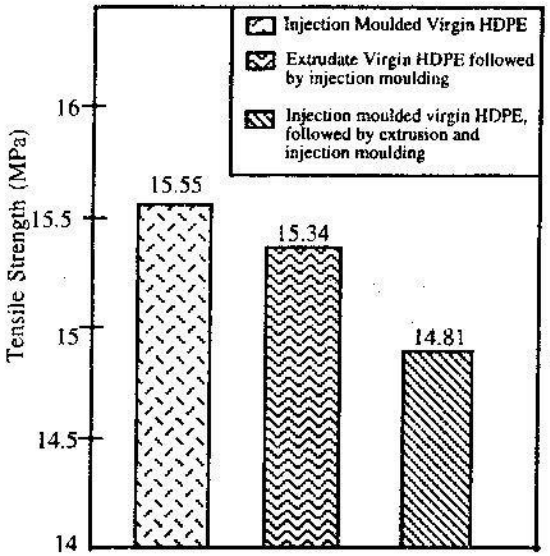


Figure 2:
Elongation at Break of HDPE at Different Type of Processing

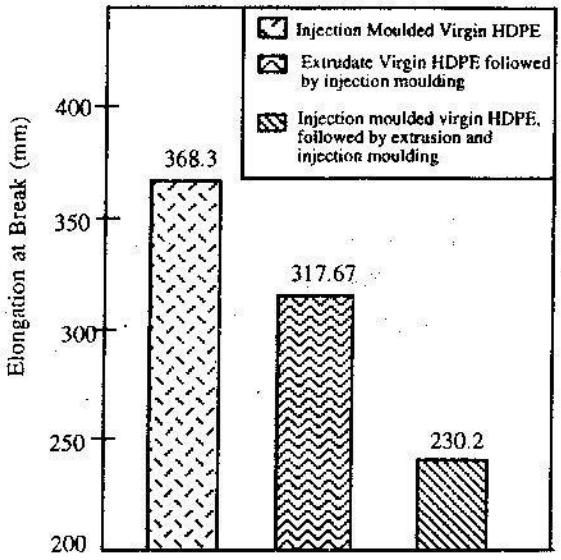


Figure 3:
Tensile Properties of Recycled HDPE
(Cast Additives)

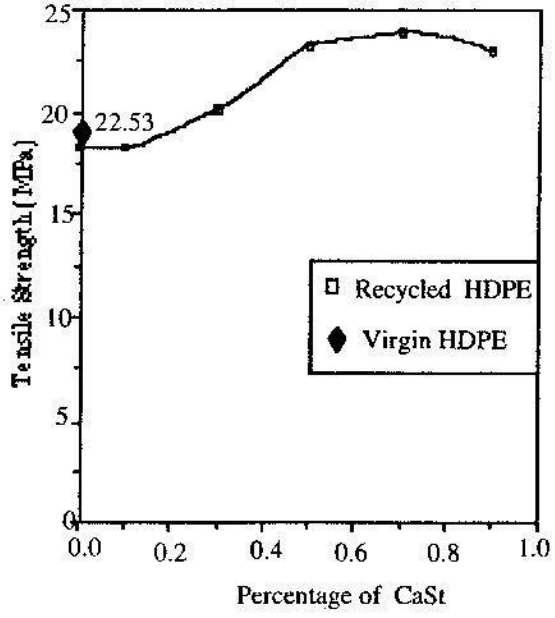
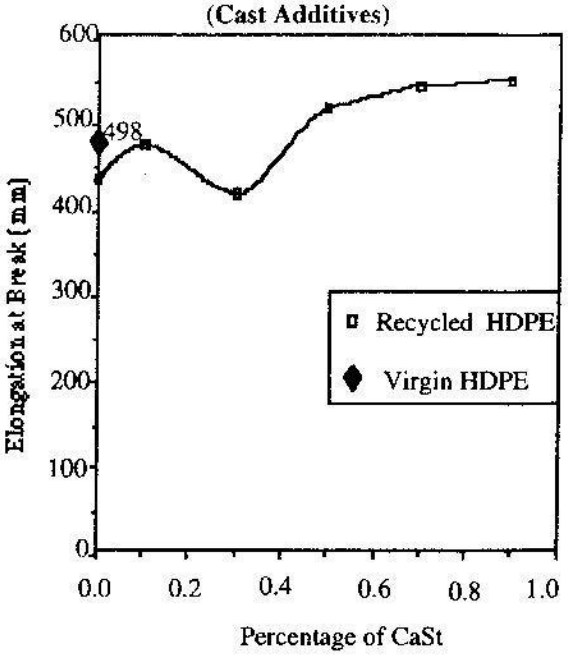


Figure 4:
Elongation at Break of Recycled HDPE
(Cast Additives)



All the results suggest that the lubricant addivitive has improved the physical property of the recycled plastics. The lubricant improved the quality by decreasing the viscosity of the resin and reduced the friction between the surface of the metal and the polymer melt during the processing (4). This action results in the decreasing degree of the degradation.

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