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USING OF FIBER COMPOSITE OF POLYPROPYLENE TO MANUFACTURING CARS BUMPERS

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ABSTRACT

This research aims to manufacturing cars bumpers from polypropylene resin reinforced by it glass fibers with different reinforcement percentage (10%,30%,50%,70%) and study the impact strength and compressive strength for obtained composite material .An Improvement was happened in these properties after reinforcement by fibers The value of mechanical properties will increase with increasing percentage of reinforcement . Impact strength increased from (85Kj/m^2) to (498Kj/m^2) and compressive strength from (51Mpa) to (310Mpa) for reinforcing percentages 0% and 70% respectively.

Keywords: Cars bumpers, polypropylene resin, Mechanical Properties.

INTRODUCTION

Composite materials play an important role in modern industry through the design and manufacture of advanced materials capable of attaining higher stiffness/density and strength/density ratios. These ratios allow composite materials to be used in various applications where the weight and strength of the structure are highly significant design parameters (e.g. aircraft, cars, and aerospace shuttle industries). Composite materials dramatically enhance the performance and increase the efficiency of such structures. In order to insure structural integrity and safe performance, thorough understanding of the behavior of these materials under arising loads must be established. Of particular importance is the problem of damage initiation and evolution in composites (Taqieddin, 2001).

Composite is a heterogeneous substance consisting of two or more materials which does not lose the characteristics of each component. This combination of materials brings about new desirable properties. Naturally occurring composites include tendon, bone, bamboo, rock, and many other biological and geological materials. For composite engineering applications, we restrict ourselves to synthetic polymer matrices which are used with naturally occurring mineral fillers such as wollastonite, silica, mica, and calcium carbonate, and synthetic fibers like glass fibers and carbon fibers (Mallick, 2007).

Glass fibers are considered the predominant reinforcement for polymer matrix composites due to their high electrical insulating properties, low susceptibility to moisture and high mechanical properties. Perhaps the most valuable property of Polypropylene (PP) is its versatility .PP is used in nursery pots and containers, row covers, yogurt cups, weed barriers, tree netting, and battery cases .PP is lightweight, durable, moderately inexpensive, and chemical resistant (Al-Mosawi *et al.,* 2011).

EXPERIMENTAL WORK

The experimental work includes the following points:

Materials

a. Matrix material, Polypropylene resin . This resin supplied by MRC Polymers, Inc. company .

b. Reinforcing fibers: chopped glass fibers E-type with density of (2.55 g/m^3) (K and C Moulding Ltd) company .

Preparation Test Samples

a. Impact Samples : impact samples fabricated according to the (ASTM-E23) standard suitable to Charby Impact Instrument .Notch depth is (0.5mm) and notch base radius is (0.25mm). Charpy Impact Instrument was used to determine the impact resistance of composite material .

b. Compressive Strength Samples: these samples fabricated according to (ASTM-D618) standard as a prism shape. Compressive strength can be measured by three point test by using universal hydraulic press (Leybold Harris No.36110) to calculate the maximum load exposed on middle of the sample.

Five samples Were manufactured for each test which different by the resin and reinforcement percentage as shown in Table 1 .Hand molding was used to manufactured the samples . Some resin spread in the mould and the fiber layer put on it and this process repeated to obtain the desired thickness.

Table 1. Structure of samples

Samples number	1	2	3	4	5
Resin(weight %)	100	90	70	50	30
Fibers(weight %)	0	10	30	50	70

RESULTS & DISCUSSION

Figure 1 represents the impact strength test for composite material before and after reinforced by fibers. The impact resistance considered low to the resins due to brittleness of these materials, but after reinforcing it by fibers the impact resistance will be increased because the fibers will carry the maximum part of the impact energy which exposition on the composite material .All this will raise and improved this resistance .The impact resistance will continue to increase with increased of the fibers reinforcing percentage (Morom *et al.,* 1986).

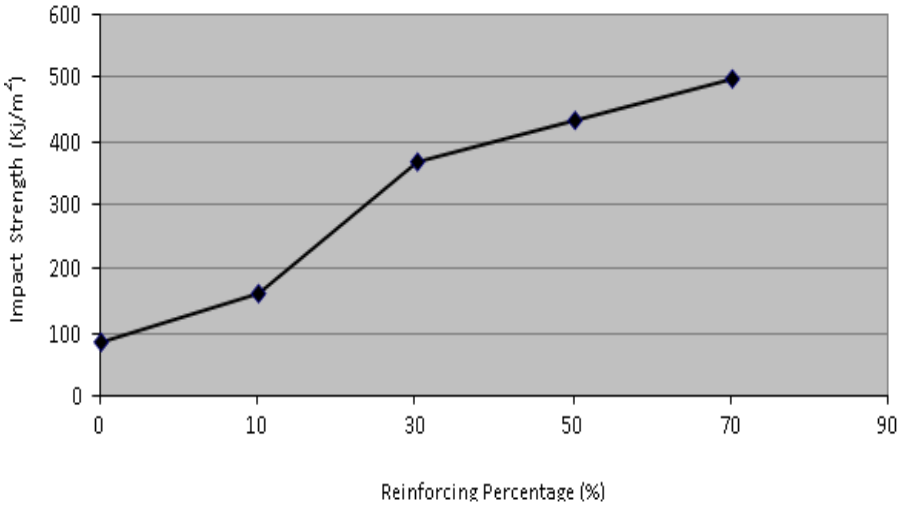

Figure 1. Impact Strength

Figure 2 represents the compressive strength test before and after reinforced by fibers .The resin is brittle; therefore its compressive strength will be low before reinforcement as shown in this figure. But after added the fibers to this resin the compressive strength will be raise to the producing material because the high modulus of elasticity of these fibers will helps to carry a large amount of loads and raise this strength (Al-Mosawi, 2009).

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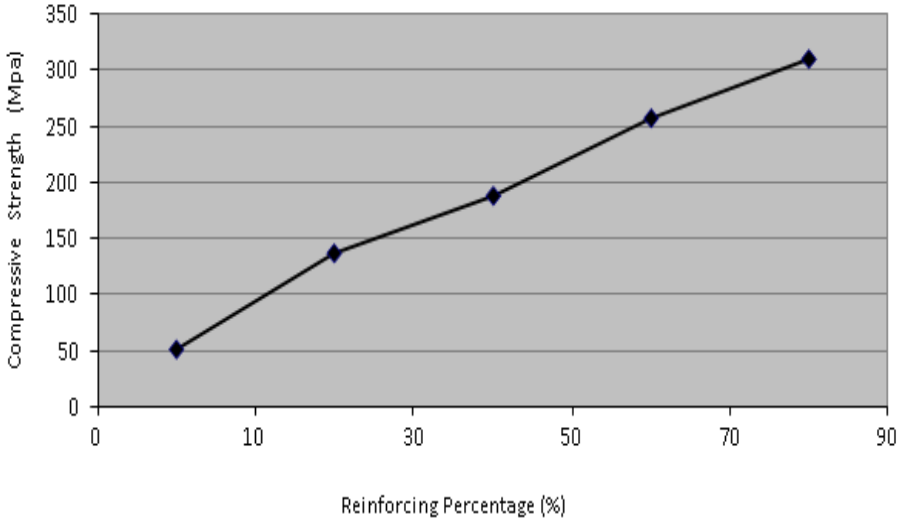

Figure 2. Compressive Strength

CONCLUSIONS

From the obtained results we get:

1. Low mechanical properties of the polypropylene resin before reinforced it.
2. Improvement of mechanical properties of car bumpers after reinforcement by glass fibers. Impact strength increased from (85Kj/m^2) to (498Kj/m^2) and compressive strength from (51Mpa) to (310Mpa) for reinforcing percentages 0% and 70% respectively.
3. The optimum reinforcing percentages was 70%.

REFERENCES

Al-Mosawi Ali, I. (2009). Study of Some Mechanical Properties for Polymeric Composite Material Reinforced by Fibers. *Al-Qadessiyah Journal For Engineering Science*, 2, (1), 14 – 24.

Al-Mosawi Ali, I., Ammash Haider, K. and Salaman Ali, J. (2011). *Properties of Composite Materials databook*. 1st edition, Misr- Almurtadah Inc.

Mallick, P.K. (2007). *Fiber-Reinforced Composites: Materials, Manufacturing, and Design*, 3rd Edition. CRC Press.

Morom G., Drukkler E., Weinberg A., and Banbaji J. (1986). Impact behavior of Carbon / Kevlar Hybrid Composites. *Composites*, 17 (2), 150-153.

Taqieddin Ziad N. (2001). *Damage mechanics of composite materials using fabric tensors*. M.Sc thesis, Louisiana State University.