MECHANICAL PROPERTIES OF FIBREED COMPOSITE OF POLYPROPYLENE

Salim J.Abbas

Technical Institute, Babylon,
IRAQ.

amam2012449@yahoo.com

ABSTRACT

This research aims to study the mechanical properties of polypropylene composite reinforced by chopped glass fibres with different reinforcement percentage (15%, 30%, 45%, and 60%) and study the impact strength and compressive strength for obtained composite material .An enhancement was happened in these properties after reinforcement by fibres the value of mechanical properties will increase with increasing percentage of reinforcement. Tensile strength increased from (33 Mpa) to (371 Mpa) and flexural strength from (0.06 Gpa) to (0.2 Gpa) for reinforcing percentages 0% and 60% respectively.

Keywords: Mechanical Properties, polypropylene resin Composite

INTRODUCTION

Polymeric composites are finding increasing applications in aerospace, chemical industry, electrical industry, auto motives, machine elements, sports equipment and many other areas. Advantages of polymeric composites over conventional materials include high specific strength and modulus, good damping properties, superior mechanical properties and design flexibility (Dobrzański et al, 2006).

Most FRP composite products are generally made by any of the standard primary manufacturing processes such as molding, filament winding, pultrusion, etc. A certain degree of intricacy in the component design necessitates assembly of sub -components to manufacture the final product (Rao and Rodrigues,2012)

The polymer matrix is considered the best because of its mechanical and thermal properties, and also it can reinforced by a large fibre volume fraction compared with metal and ceramic matrix (Niyogi,2007). In addition to the low cost and easy fabrication, as example for this materials araldite resin, polyester, and epoxy resin. 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 (Gomec, et al,2005). PP is lightweight, durable, moderately inexpensive, and chemical resistant. It can be found in either film or rigid form. Many of these properties make PP popular to use for food packaging such as screw-on caps, juice containers, and straws (Al-Mosawi et al, 2012).

Glassfibres 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 (Miller ,1998).

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MATERIALS AND METHODS

Materials

a. Matrix material, Polypropylene resin. This resin supplied by MRC Polymers, Inc. company.
b. Reinforcing fibres: chopped glass fibres E-type with density of (2.55 g/m^3) (K and C Moulding Ltd) company.

Preparation Test Samples

a. Tensile strength samples: these samples manufactured according to the (D638-10) standard. Tensile test was used to calculate the tensile strength of composite material under uniaxial load .The universal test instrument manufactured by (ZheJinang TuGong Instrument Co., Ltd) used to measure this property with a (20KN) load.
b. Flexural Strength Samples: these samples fabricated according to (ASTM-D790) standard. Flexural strength can be measured by three point test by using universal hydraulic press (Leybold Harris No.36110) .

Five samples were manufactured for each tests which different by the resin and reinforcement percentage. Hand molding was used to manufacture the samples. Some resin spread in the mould and the fibre layer put on it and this process repeated to obtain thedesired thickness.

RESULTS & DISCUSSION

Figure 1 represents the tensile strength value with reinforcement percentage. The resin considered asbrittle materials where its tensile strength is very low as shown in this figure, but after reinforcing by fibres this property will be improved greatly, where the fibres will withstand the maximum part of loads and by consequence will raise the strength of composite material (Sadeq, 2011).

The tensile strength will be increased as the fibres percentage addition increased, where these fibres will be distributed on large area in the resin.

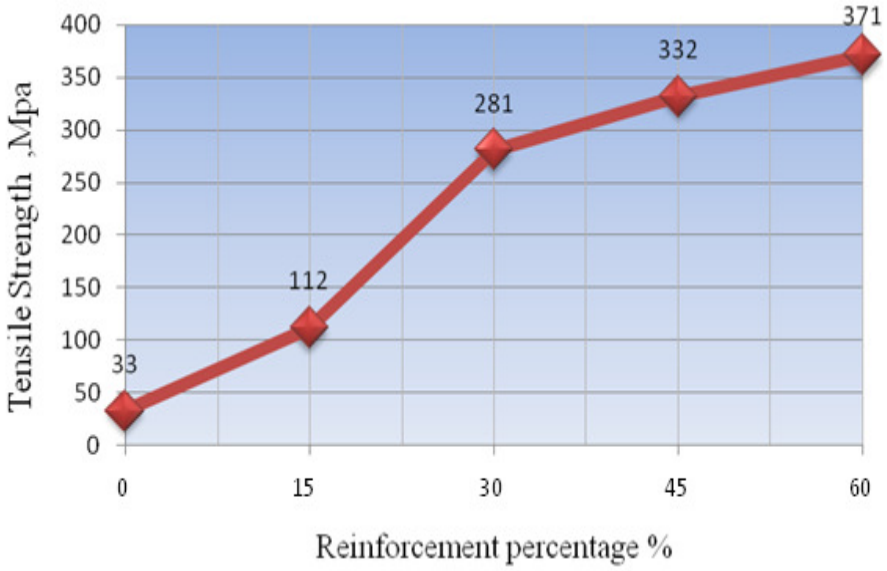

Figure 1. Tensile strength value with reinforcement percentage

Fig.2 represents the value of flexural strength with reinforcement percentage. Flexural resistance considered low to the resins due to brittleness of these materials, but after reinforcing it by fibres the flexural resistance will be increased because the fibres will carry the maximum part of the flexural energy which exposition on the composite material (Schlichting et al, 2010).

The flexural resistance will continue to increase with increased of the fibres reinforcing percentage.

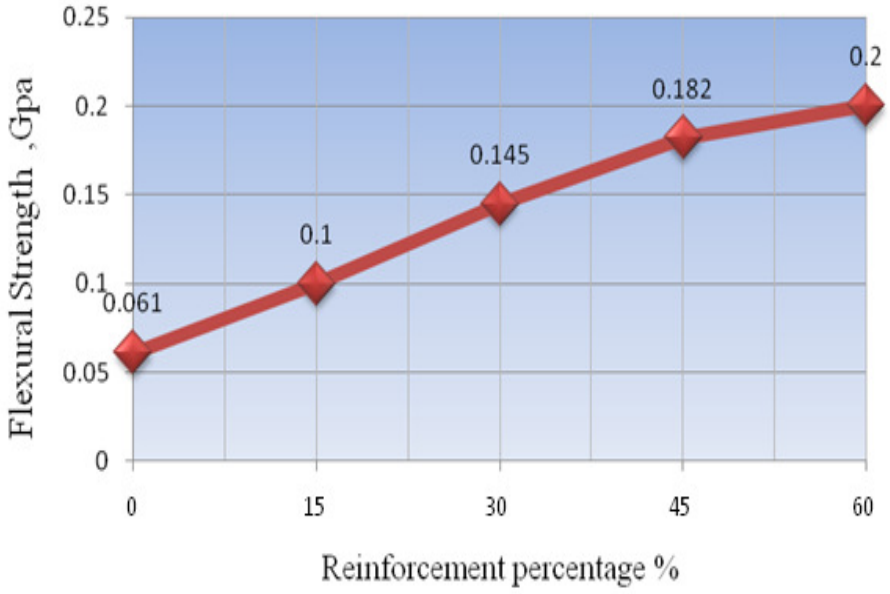

Figure 2. Flexural strength value with reinforcement percentage

CONCLUSIONS

mechanical properties of the polypropylene resin was low before reinforcement, but after reinforced it by glass fibres these properties were enhanced .Tensile strength increased from (33Mpa) to (371Mpa) and flexural strength from (0.06Gpa) to (0.2Gpa) for reinforcing percentages 0% and 60% respectively ,and the optimum reinforcing percentages was 60%.

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