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USING OF ARAMID FIBRES REINFORCED POLYSTYRENE FOR MANUFACTURING AUTOMOTIVES PARTS

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ABSTRACT

The present research aim to study the effect of the reinforcement by fibres on mechanical properties of composite material consist of polystyrene resin reinforced by aramid fibres which can be used to manufactures auto motives parts such as bumpers .The properties included compressive and flexural strength , where the mechanical properties were extracted for polystyrene resin before reinforcement by fibres, then we reinforced the resin by different weight percentage from aramid fibres (%15,%30, %45, %60)and studied the effect on the above mechanical properties. The result obtained show An improvement in these properties after reinforcement by fibres The value of mechanical properties will increase with increasing percentage of reinforcement .Compressive strength increased from(92Mpa) to (163Mpa) and flexural strength from (0.08Gpa) to (0.165Gpa) for reinforcing percentages 0% and 60% respectively .

Keywords: Mechanical properties, Polystyrene resin, Aramid fibres.

INTRODUCTION

Composite materials were known to mankind in the Paleolithic age (also known as Old Stone Age). The 300 ft high ziggurat or temple tower built in the city centre of Babylon was made with clay mixed with finely chopped straw (Ali, 1999). In recent years, polymeric based composite materials are being used in many applications, such as automotive, sporting goods, marine, electrical, industrial, construction, household appliances, etc. Polymeric composites have high strength and stiffness, light weight, and high corrosion resistance (Charles, 2011). Composite materials are said to have two phases: Matrix material : it is the continuous phase; it may be metal, ceramic or polymer matrix.

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 (Michel Biron, 2007). In addition to the low cost and easy fabrication, as example for this materials araldite resin, polyester, and epoxy resin. Araldite resin belong to epoxy group which has excellent thermal and physical properties, and usually used in composite materials for different applications, where it distinct by excellent adhesive capability especially to fibres, also it retain constant dimensions after dryness (Ali I.Al-Mosawi *et al.,* 2011).

Reinforcing material: The distributed phase is called reinforcement, many reinforcement materials are available in a variety of forms; continuous fibres; short fibres; whiskers, particles...etc. (Noor Sabah Sadeq, 2011). The primary function of fibres or reinforcements is to carry load along the length of the fibre to provide strength and stiffness in one direction. Reinforcements can be oriented to provide tailored properties in the direction of the loads imparted on the end product. Reinforcements can be both natural and man-made. Many materials are capable of reinforcing polymers. Some materials, such as the cellulose in wood, are naturally occurring products. Most commercial reinforcements, however, are man-made (Liyong Tong *et al.,* 2002).

MATERIALS AND EXPERIMENTAL PROCEDURE

Aramid fibre was used for the composite preparation. In this work woven roving fabric style was used 0º-45º with 1.47g/cm^3 density .The fibre content in each composite was of %15,%30, %45, %60 as a weight fraction .This fibres was used to reinforced polystyrene resin with 1.05g/cm^3 density ,this resin

manufactured by Hexcel Company and it is a structural resin with a glass transition temperature of 100°C .

Aramid fibres reinforced polystyrene composite was fabricated by the hand layup technique using laboratory compression moulding machine. Two types of samples were manufactured as follows: Flexural Strength Samples: these samples fabricated according to (ASTM-D790) standard .Compressive Strength Samples: was manufactured according to (ASTM-D618) standard. Flexural and compressive strength can be measured by three point test by using universal hydraulic press (Leybold Harris No.36110).

RESULTS & DISCUSSION

Figure 1 represent compressive strength test to composite material. The resin is brittle, therefore its compressive strength will be low before reinforcement as shown in, But after added the fibres to this resin the compressive strength will be raise to the producing material because the high modulus of elasticity of these fibres will helps to carry a large amount of loads and raise this strength (Al-Mosawi, 2009).

Figure 2 shows the value of flexural strength with fibres reinforcing percentage. Generally, the 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 .All this will raise and improved this resistance .The flexural resistance will continue to increase with increased of the fibres reinforcing percentage (Al-Jeebory *et al.*, 2009).

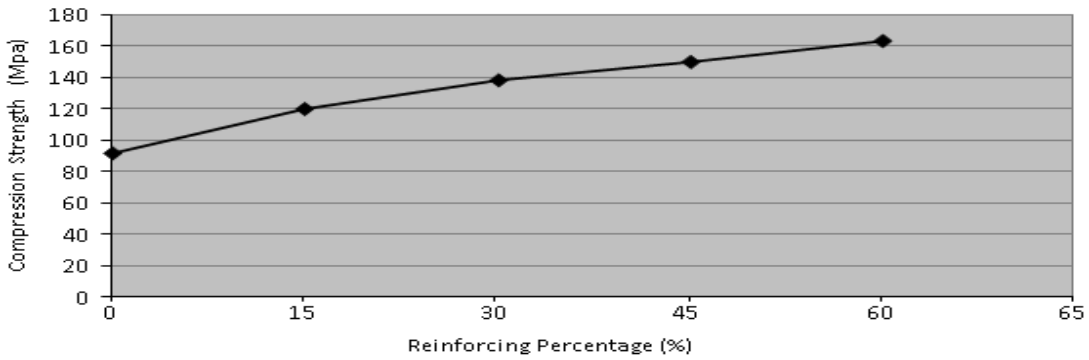

Figure 1. Compressive strength test

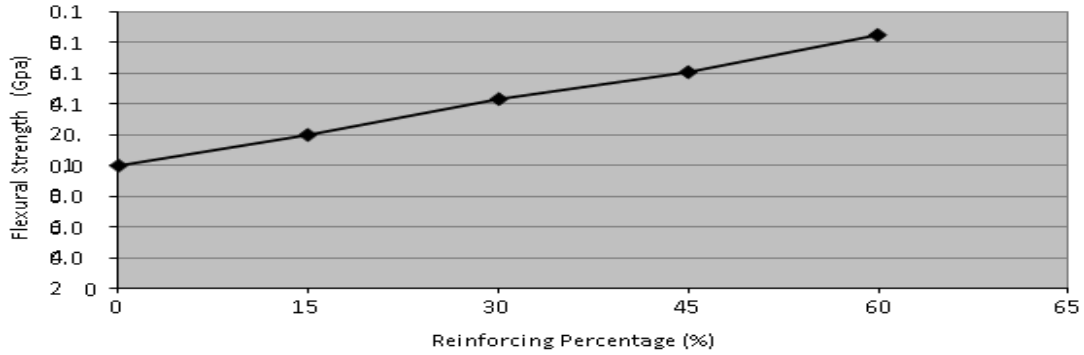

Figure 2. Flexural strength test

CONCLUSIONS

From the obtained results we get: Low mechanical properties (Flexural and Compressive Strength) of the polystyrene resin. Enhancement of mechanical properties after reinforcement by aramid fibres.

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