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THERMAL CONDUCTIVITY OF HYBRID BLEND REINFORCED BY FIBERS WITH DIFFERENT MIXING RATIO

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ABSTRACT
Thermal conductivity increases with increased angular bonding intensity, which significantly affects the degree of padding of molecular chains. The presence of spaces between polymer chains decreases with the increase of interstitial bonding, making the transition from one side to another through plastic material easy

Keywords:
Hybrid blend, Thermal conductivity, Carbon Fiber , Nano Particles , Mixing Ratio

INTRODUCTION

The solid matter is made up of free electrons and atomic bonds in a cyclic order called splicing. Accordingly, the transfer of thermal energy results from two effects: the free electron migration and the vibrational waves of the chain[1,2]. This means that the thermal conductivity is the sum of the electronic compound, Thermal properties on the frequency of reciprocal interactions between the splicing atoms and the surface radiation properties of the solids, the spherical size of the air or vacuum space and the nature of the solid bond between them[3,4]. The previous studies indicate an increase in the values of the thermal conductivity of the combined hybrid spectra with the increase of the fraction of the particles of the graphite[5]. This is because the graphite particles have a high thermal conductivity, and the presence of the graphite particles reduces the percentage of air bubbles formed in the hybrid, Heat transfer[6]. The rate of increase in the values of the thermal conductivity of samples prepared from polystyrene, glass fibers and graphite minutes is higher than in the samples supported by kefler fiber rather than glass, because the kefler fiber is more isolated Of glass fiber, because the kefler fibers have a decrease in thermal conductivity values of 0.04w / m.k compared to the thermal conductivity of E-glass fibers of w / m.k (1.3) [7]. The effect of the particle size of the graphite particles with the 10% volumetric fraction on the thermal conductivity coefficient of the hybrid composite material prepared in this research indicates that the values of the thermal conductivity coefficient increase with increasing the particle size of the graphite particles, because the presence of minutes in small granular sizes mixed with the base material facilitates From the process of flowing liquid material to the inside of the fence located within the fiber network as well as filling the air freshener and gaps within the base material, which helps to increase the area of the petition and create large areas rich in basic material and the basic material has a recommendation The thermal conductivity increases with the increase in the particle size of the graphite particles[8]. This is similar to the results obtained by Zhang and his colleagues when studying the effect of the particle size of the graphite particles on the conductivity Thermocouples for carbon electrodes prepared from polymeric-based overlays [9]. The solid matter is made up of free electrons and atomic bonds in a cyclic order called splicing. Accordingly, the transfer of thermal energy results from two effects: the free electron migration and the vibrational waves of the chain[10]. This means that the thermal conductivity is the sum of the electronic compound, Thermal properties on the frequency of reciprocal interactions between the splicing atoms and the surface radiation properties of the solids, the spherical size of the air or vacuum space and the nature of the solid bond between them[11]. The previous studies indicate an increase in the values of the thermal conductivity of the combined hybrid spectra with the increase of the fraction of the particles of the graphite. This is because the graphite particles have a high thermal conductivity, and the presence of the graphite particles reduces the percentage of

air bubbles formed in the hybrid, Heat transfer[12]. Composite materials in this regard represent nothing but a giant step in the ever-constant endeavor of optimization in materials. Strictly speaking, the idea of composite materials is not a new or recent one. Nature is full of examples wherein the idea of composite materials is used[13]. In the 20th century, modern composites were used in the 1930s when glass fibers reinforced resins. Boats and aircraft were built out of these glass composites, commonly called fiberglass . Since the 1970s, application of composites has widely increased due to development of new fibers such as carbon, boron, and aramids, and new composite systems with matrices made of metals and ceramics[14].

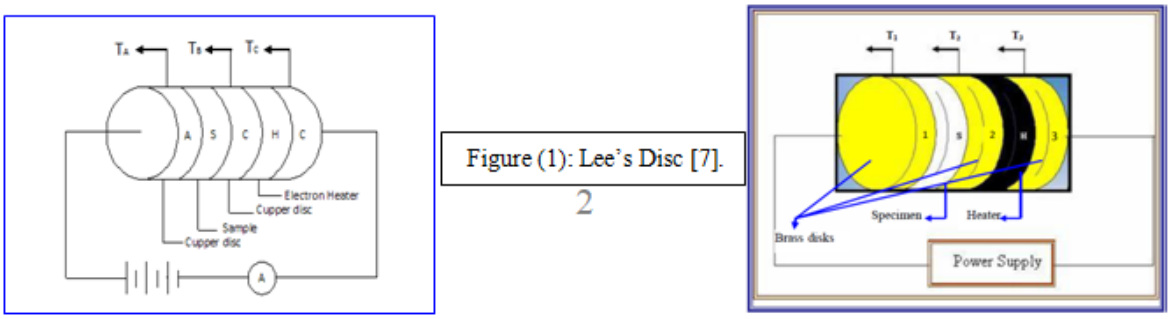

Figure (1): Lee's Disc [7].

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The AIM OF THE RESEARCH

The general use of the composite material depends largely on the Thermal conductivity of these materials. Therefore, the study of these properties under the influence of heat and forces , loads in different conditions is of great importance for determining the suitability of these properties to the work place of these materials. The mixing of the epoxy material with the phenolic formaldehyde resin, which is called the resole, is used in the use of different mixing ratios for the purpose of making samples for the necessary tests to obtain the Thermal conductivity and analyze them and compare them with the Thermal conductivity of the foundry, The engine oil pan was selected as part of the study in order to replace the alloy with the composite material used in the research for weight loss and improvement of Thermal conductivity. A simulation program was used in which the composite material used in the research was tested and compared to the material of which the part is originally manufactured.

EXPERIMENTAL PROCEDURE

Materials: Epoxy resin (LEYCO-POX 103),Phenol formaldehyde (resole) resin

Samples preparation and Calculation of Thermal conductivity: epoxy and phenol formaldehyde resin were mixed with different weight fraction as shown in Table.1. Thermal conductivity measurements were made using the Lee's disc method, this instrument was manufactured by the Griffen and George company.

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Table (1) The Effect of mixing ratio on the thermal conductivity.

Sample No.	K-value , W/m.°c
E0	0.523489
E1	0.814918
E2	0.994818
E3	0.948067

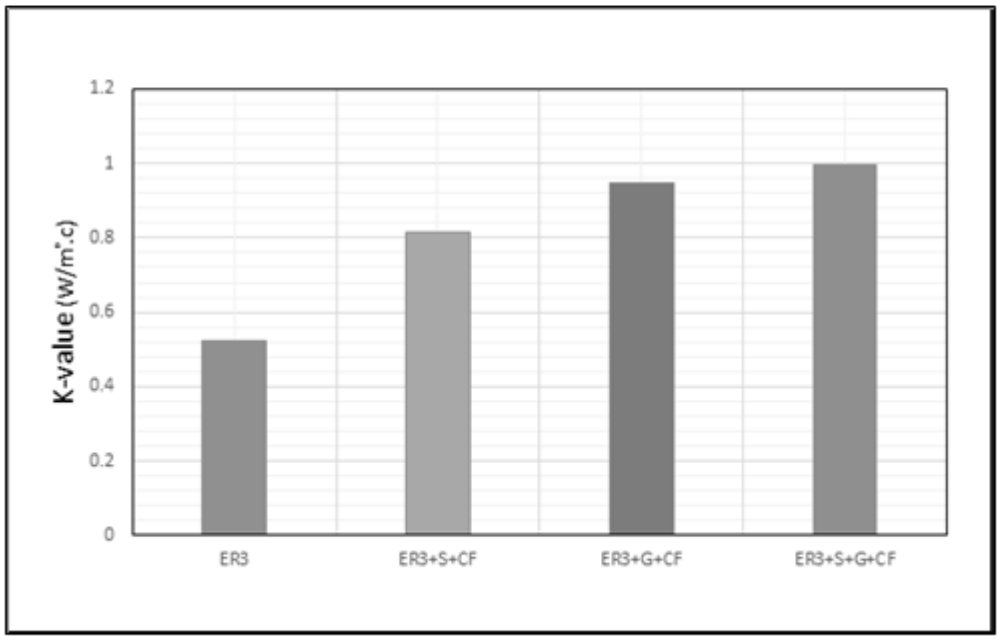

Fig.2: Thermal conductivity of composite material.

Sample No.	Composition
E0	(Epoxy/Resole) (80/20)%
E1	(Epoxy/Resole) (85/15)%
E2	(Epoxy/Resole) (90/10)%
E3	(Epoxy/Resole) (95/5)%

Table.2: Composition of epoxy-phenol formaldehyde hybrid blend .

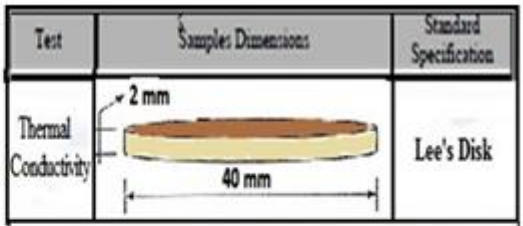

Fig.3a: The samples dimension for thermal conductivity test.

Fig.3b: The samples for thermal conductivity test.

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For the purpose of making samples for the necessary tests to obtain the thermal conductivity and analysis and compare them with the thermal conductivity of the alloy, which is the part of the original, which was chosen for the purpose of replacement of the alloy composite material used in the search for weight loss and improve thermal conductivity.

RESULT AND DISUCSSION

Thermal conductivity test:

fig. (2) shows thermal conductivity of the composite blends , K-value is increase from (0.523489 W/m℃) at (80% epoxy+20% resole) to (0.814918 W/m℃) when adding silica Nano particles and carbon fibers (51.2% epoxy+12.8% resole+16% silica+20% carbon fibers) and it increasing to (0.948067 W/m℃) when adding graphite Nano particles and carbon fibers (51.2% epoxy+12.8% resole+16% graphite+20% carbon fibers) and it maximum value (0.994818 W/m℃) when adding silica Nano particles and graphite Nano particles together (51.2% epoxy+12.8% resole+8% silica+8% graphite+20% carbon fibers), The thermal conductivity (k) of the samples was calculated based on the temperature obtained from the Li disk. In previous studies, a reduction in the thermal conductivity values by increasing the volume fraction of the nylon fibers was observed due to the nature of the fiber being thermally insulated. [6] On the insulation the presence of fine fiber filaments, which leads to the transfer of thermal energy in two ways (conductivity and pregnancy) as the transfer of elastic waves (photons) through the base material and the hard part of nylon fiber by vibration movement of atoms and the effect of covalent cue, and when the arrival of photons to the part of the sun Irrigation of nylon fibers The photons suffer from obstruction due to the different structural structure of this medium (because it has atoms and bonds different from the previous medium) because it has atoms and bonds different from the previous medium, which will lead to a decrease in the value of thermal conductivity [3], and studies indicate that The conductivity values are reduced by increasing the volume fraction of the nylon fibers. The rate of reduction in the thermal conductivity values for the randomized samples in the fiber arrangement is greater than in the samples with the specific pattern. The fibers are distributed in all directions. Exclusive depend on the type of fiber and in the direction of the foundation material [9,10]. The effect of the laminar system on the thermal conductivity values of the fixed volumetric fracture is that the lattice system in the armature reduces the thermal conductivity values and the rate of decrease depends on the nature of the fiber material for the outer layers. The samples whose outer layers are armed with glass fibers have higher thermal conductivity This is due to the nature of fiberglass, which helps transfer thermal energy because it contains in its internal structure an ionic as well as covalent bond, which leads to the ease of movement of photons within the fiberglass [3]. The thermal energy of polymers is transmitted by vibrations and rotation of chain molecules, and plastics are heavily affected by temperature changes depending on the type and composition of the plastic material. Plastics with linear chains are more effective because of the weak interstitial forces between their chains that are easily exceeded, It has a three-dimensional grid structure that, despite changing its properties and behavior, maintains its structure and a wide range of temperatures [6]. Thermal conductivity increases with increased angular bonding intensity, which significantly affects the degree of padding of molecular chains. The presence of spaces between polymer chains decreases with the increase of interstitial bonding, making the transition from one side to another through plastic material easy. The amount of thermal conductivity depends on the degree of crystallization of the "Degree of Crystallinity", and polymer crystallization has a higher delivery of random polymers because the vibrations of the axes are more effective for the molecules of chains in the crystallized state [4]. Since high density polyethylene (95%) has a higher (0.449167 W / m.Ko) than polystyrene (100%) with a value of 0.2888506 W / m.Ko. The thermal conductivity of the mixture Less than (0.45 W / m.Co) reflecting the high resistance of the material to heat transfer. This means that it is suitable for use as a thermal insulation (thermal conductivity), this little thermal conductivity due to the fact that these polymers do not have free electrons and low photon speed [2]. The lowest heat conductivity (pure thermal insulation) for pure polymers was for the high pure polystyrene (0.2888506) W / m.Ko. The process of energy transfer through the material (thermal conductivity) is one of the main physical phenomena that can be studied and interpreted how the material is affected by heat, the thermal conductivity is obtained when there is a difference in temperature, which leads to the generation of thermal flow

continues until the amount of gradient (gradient) At temperatures equal to zero as a result of the transfer of energy from the top-temperature side to the lower-temperature side [5,7]. The value of the thermal conductivity (K) of the overlapping materials is affected by the density of the interconnectivity, which increases thermal conductivity, but sometimes the addition of some particles may reduce the density of the interstitial bond. This leads to the formation of pores and gaps inside the material. Additive [3].Previous studies show that the value of the thermal conductivity of the overlapping material is affected by different fractions. The highest thermal conductivity value was found for the sample with 70% reinforcement. This is due to the increase in the proportion of reinforcing materials containing percentages of conductive materials than in the weighted fracture sample 60% [10]. The results showed a significant reduction in the conductivity values of the 80% and 90% fractional samples because of the low ratio of the bonding material to the reinforcing material, which leads to a decrease in the density of the bonding of the components of the sample. The value of K depends on the density of the interconnectivity because the molecules of the material touch one another, thus generating high conductivity. The value of the constant thermal conductivity coefficient of composite materials with different ratios of carbon fiber, found that the value of thermal conductivity increases significantly with the increase of the rate of support of this fiber, because the carbon fiber has a high ability to conduct thermal conductivity.

CONCLUSION

[1] The thermal conductivity coefficient of the composite material is affected by different weight fractures.
[2] The thermal conductivity increases significantly with the increase in the rate of support of this fiber, because the carbon fiber has a high degree of thermal conductivity.
[3] A significant decrease in the conductivity values of the samples due to the decrease in the ratio of the bonding material relative to the reinforcing materials, which leads to a decrease in the density of the interconnectivity of the sample components.

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