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Thermal Characteristics of Epoxy Composites: A Perspective View

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Abstract- When two or more materials are combined and one material is in reinforcing phase are in the form fibers and are embedded in the other material called matrix are called Composites. Main functions of composites are to transfer loads between reinforcing fibers and to protect them from mechanical damage. The function of fiber material in composite is to increase the mechanical properties such as strength and stiffness etc. A composite is therefore a synergistic combination of two or more constants which differ in physical form and chemical composition and are not soluble in each other. The motive is to take advantage of their respective properties.
Composites are mainly selected for engineering application because of their higher strength to weight ratio, high creep strength and high toughness. Strength of composite primarily depends on amount, arrangement and type of fiber.
Keywords: Materias, Composite, Synergistic.

I. INTRODUCTION

Natural fibers from renewable raw material have low density and cell structure and they have better thermal and sound insulating characteristic. Large amount of energy can be saved by using proper insulating materials in engineering structures, buildings and equipment. Gases have very less thermal conductivity. So enveloping any material with air packet can decrease the heat transfer significantly. Insulating material commonly like wool or glass fiber are cheap and available. Plastic like phenolic foam have greater insulating capacity with thermal stability. There is vital importance of insulation from technological and industrial view point. It is not only useful in saving energy but also plays a major role in industrial safety.

Bricks are normally used for developing structures which is main factor of farm land reduction. They are also not as much insulating as composite material. So they are undesirable both in terms of environmental pollution and energy wastage. Therefore there is focus to make environment friendly material which can be used for structures

With insulating properties Insulating materials like cellulose has thermal conductivity in the range of 40 - 50w/mk. Experiments have shown that natural materials are as effective as common building material. Lingo cellulose fiber is investigated by some researchers and they have given satisfactory results. Coconut coir and durian peel can also be used to make cost effective insulating material as studied core can be used to make insulating material with insulating capacity comparable to rock wool by steam injection processing as presented Binder less cotton stalk from cotton is without using resin and additive can be also an environment friendly insulating material studied the insulating properties of date palm wood and found it to be equally effective as any other insulating material.

Sheep wool fiber can also be considered as insulating material with insulating property compared to conventional insulating material The wastage of industry and food processing units as raw material can be used in building application Much of previous work mainly interested in strengthening by reinforcing to decrease the density, but with higher demand to energy saving material there is now a renewed focus in natural thermal insulating material. As the natural fibers have better hygro thermal properties and cheap they can be used with petroleum derived products to make better composite material.

Sunflower as binder mixed with protein and lingo fiber as reinforcing material. developed a thermally insulated composite.

II. BACKGROUND DETAILS

With growing shortage of fossil fuel and increasing global warming there is a greater demand to improve the energy efficiency of engineering component and structures. The advantage of energy efficient engineering structures and building is well known. To get this insulation one can apply thick layers of insulating materials. But this can make the constructions thick with added higher cost and loss of floor area. Best thermal insulating material that can be considered are vacuum insulating panels [1] and aerogel based materials. The insulating properties of the materials can be explained by a reduced gas phase conductivity based on vacuum and pore size under 100 nm. But these materials have te disadvantage of processibility and high cost [2].

There is always heat transfer occurs when there is a temperature difference between two bodies. Insulation provides a medium to decrease the heat transfer. Thus thermal insulation can be said to decrease in heat transfer between bodies in contact or in range of radioactive influence.
Insulators are these materials which decrease heat transfer by doing any of the following function [3].

- Conservation of energy by decreasing heat loss or gain
- Manage surface temperature for staff protection and comfort
- Prevent vapor flow or water condensation on cold surface
- Enhance efficiency of heating or cooling process
- Prevent damage to equipment from fire or corrosive atmosphere.
- Polymers have some very desirable properties like low thermal expansion coefficient, corrosion resistance, thermal conductivity, wear resistance etc. They are more popular because of their low cost, electrical insulating properties, easy to manufacture. Polymers are mainly divided into two main types, thermoplastics and thermo sets. Both of them have different properties as per their molecular structure.
- Thermo set polymer are irreversible once they are heated and they have a structure of cross linked amorphous matrix. They show good thermal electrical and thermal insulating properties as they have bigger molecular structure. Due to their low viscosity they can wet well and have good thermal stability and creep resistance. Polyester, epoxy, vinyl ester are some commonly used thermo set plastics.

Thermoplastic are different from thermo set in a way that they can be remolded as the intermolecular forces increase after cooling and comes back to original properties. They normally produced in a step then are turned into different products in subsequent processing. So they can be recycled after reheating and can be given any shape afterwards. Nylon, acrylic, polypropylene, polyethylene, polyvinyl, polystyrene, Teflon is some of the popular thermoplastics. Epoxy is most popular among all the thermo set plastics as they good adhesion to many fibers, better electrical and mechanical properties and they show better properties at higher temperature. They also have desirable qualities like better chemical resistance, low shrink after curing. Epoxy (LY556) is used for matrix material in this investigation.

III. CONCUSIONS

This analytical and experimental investigation on epoxy composite with bagasse fiber has given the following conclusion

- Using hand layup method epoxy bagasse fabricated composite can be made
- Using one dimensional heat conduction a mathematical model to calculate effective thermal conductivity of fiber filled polymer composite is developed.

- To develop a theoretical model predicts the effective thermal conductivity of polymer composite.
- To predict effective thermal conductivity using finite element method.
- Developing different samples of polymer composites with bagasse fiber.
- Validating the theoretical model with FEM result.

Exploring the possibility of this polymer in household and industrial use.

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