

# ESTIMATING EFFECTS OF TEMPERATURE ON TENSILE STRENGTH OF E-GLASS COMPOSITE WITH UNSATURATED ORTHOPHTHALIC POLYESTER RESIN

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**Abstract:** Effect of temperature on composite materials with E-glass fibers and unsaturated orthophthalic polyester resins has been investigated. Effect of temperature on properties of composite is investigated. Resin of unsaturated orthophthalic polyester is used which is very cheap and can be made available easily. Composite materials have been widely used to produce high strength members because of low cost and flexibility in material and structure design, high strength and modulus to weight ratio. Composite are used under various environmental conditions. To test the effects of various environmental conditions present study is performed. This study lists the effects of temperature from 25°C to 85°C for composite material having e-glass fiber with unsaturated orthophthalic polyester as resin. Results show considerable decrease in tensile strength with increase in temperature.

**Keywords:** Composites, e-glass, resin, temperature, tensile test.

## I. INTRODUCTION

Composite materials involve two or more physically separate and mechanically separable components called reinforcement and matrix. These two components can be mixed in a controlled way to achieve optimum properties, which are superior to the properties of each individual component. E-Glass or electrical grade glass was initially developed for standoff insulators of electrical wiring. It was later found to have outstanding fiber forming capabilities and is now worn almost exclusively as the reinforcing phases in the material commonly recognized as fiberglass. Preparing composite with fiber is well known. E-glass and

unsaturated orthophthalic polyester are most commonly used materials for composite. Ortho-polyester is a low cost general purpose resin. Testing composite is always a challenge. Uniaxial tests on composite laminates require the maximum level of precision and stiffness - so that alignment can be established and maintained. If a precision testing system (load frame), not available results can be negotiation because composite materials are so sensitive to alignment.

## II. EXPERIMENTAL METHODS

The most common testing machine used in tensile testing is the universal testing machine. This type of machine has two crossheads; one is adjusted for the length of the specimen and the other is driven to apply tension to the test specimen. There are two types: hydraulic powered and electromagnetically powered machines. Figure 1 shows tensile testin machine.



Figure 1: Tensile testing of Composite

The composite specimens are cut from the plates described above, according to the size recommended by the standards for the tensile test (Fig. 2).

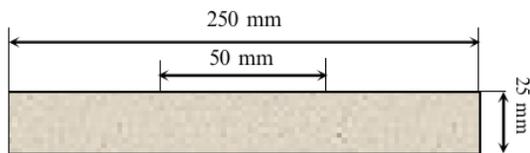


Figure 2: Tensile testing specimen

All the testing are done as per recent standards available for testing of ompsite materials. Extra care was taken to tune high sensitivity of composite materials.

### III. RESULTS AND DISCUSSION

To investigate the environmental effects on basic mechanical properties of composites, tension tests were performed for composites with unsaturated orthophthalic polyester resin systems using the glass fabrics. The 90° tension tests were run and results for ultimate tension strength (UTS), are presented as a function of test temperature in fig. 3.

Table 1: Temperature vs Tensile Strength

S. No.	Temperature °C	Tensile Strength MPa
1	25	495
2	40	490
3	55	475
4	70	450
5	85	395

Field of composite is still a evolving field. There is lot of lack in performing a standard test on composite materials. Under the present set of condition composite materials prepaed showed a considrable drop of tensile strenght. Fig. 3 shows a graph between temperature and tensile stranght of composite material.

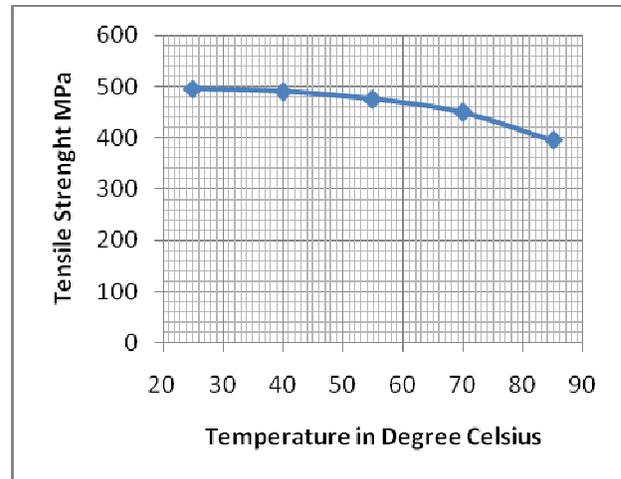


Figure 3: Temperature vs Tensile Strength

From fig 3 and table 1 it is evident that temperature and tensile strength has inverse relation.

### IV. CONCLUSIONS

Temperature and tensile strength for e-glass fiber and unsaturated orthophthalic polyester resin are inversely related. With rise in temperature the tensile strength decreases. By increase in 60°C temperature the tensile strength of composite decreased by 100 MPa. In percentage terms the 60oC rise temperature decreased tensile strength by 20%. One more point to consider is that as temperature increases the rate of decrease in tensile strength increases considerably.

### V. FUTURE SCOPE

Present study is restricted to show one effects of one environmental on one mechanical properties of composite material. Present composite material has wide application under different environmental conditions. All those condition can also be tested to know the effects on mechanical properties. Present study includes only one tensile test. As composite materials have directional properties, tensile strength and other properties can be tested in all other possible loading directions.

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