International Conference on Recent Innovations in Engineering and Management
Dhananjay Mahadik Group of Institutions (BIMAT) Kolhapur, Maharashtra (ICRIEM-16)
23rd March 2016, www.conferenceworld.in ISBN: 978-81-932074-5-1

THEROTICAL STUDY OF DIFFERENT TYPES OF COMPOSITE MATERIALS

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ABSTRACT

Composite material is defined as two or more materials at miscropic level chemically distinct phase. Ther are two types of composite materials. First one is Homogeneous & second is Heterogenus. Homogeneous are at microscopic scale and Heterogenus are at macroscopic level.Composite materials are very important to structrual applications. Because its different ratio as strength to weight ratio, stiffeness to weight ratio and force to weight ration are very good. Also composite materials are useful in construction of aerospace structures. Aircraft parts made from composite materials, such as fairings, spoilers, and flight controls, were developed during the 1960s for their weight savings over aluminum parts.In new generation large aircraft are design with different composite materials. Generally composite materials like glass fibers, epoxy carbo fibers & laminated glass fibers are used in automobile components like propeller shaft, leaf spring.

Keywords: Composite Materials, Automobile, matrix, stifness etc.

I. INTRODUCTION

A composite material can be defined as a combination of two or more materials that results is better than properties those of the individual components used alone. In contrast tometallic alloys, each material retains its separate chemical, physical, and mechanical properties. The two constituents are a reinforcement and a matrix. The main advantages of composite materials are their high strength and stiffness, combined with low density, when compared with bulk materials, allowing for a weight reduction in the finished part. The part of reinforcement it provides strength & stiffness. The reinforcement is harder, stronger, and stiffer than the matrix. The reinforcement is usually a fiber or a particulate. Particulate composites have dimensions that are approximately equal in all directions. They may be spherical, platelets, or any other regular or irregular geometry. Particulate composites tend to be much weaker and less stiff than continuousfiber composites, but they are usually much less expensive. Particulate reinforced composites usually contain less reinforcement (up to 40 to 50 volume percent) due to processing difficulties and brittleness.

II. DIFFERENT TYPES OF COMPOSITE MATERIALS

Natural composites:- Wood (Cellulose / lignin), Bone (apatite / collagen), Nacre, Granite (quartz / feldspars).
Cement Mortar concrete :- ferro cement.
Carbon Composites :- Metal Matrix, Textron with diamond coated.
Nano composited :- Intercalated nano composites, Ex foliated nano composites.

Conventional composites.

Man Made composites:- Matrix, Reinforcement, Polymar (Organic), Metal, Ceremic, Graphite, fine reinforced plastics.

III. DESIRED PROPERTIES OF COMPOSITE MATERIALS

Strength.

Stiffeness.

Toughfness.

Corrosive resistance.

Wear Resistance.

Reduced weight.

Fatigue life.

Thermal / Electrical insulation and conductivity.

Acoustic insulation.

Energy dissipation.

Attractivness, cost.

Tailorable properties.

IV. DIFFERENT COMPOSITE MATERIAL AND THEIR PROPERTIES

Fiber glass:-

It has high resistance to current flow.

Structural glass that have higher strength than E-glass.

Fiber glass have lower cost than other composite materials, chemical or galvanic corrision resistance.

Kevlar:-

Thease are light weight, strong and toughf.

High resistance to impact damage.

Carbon Graphite:-

Bonding between planes is strong.

Very stiff and strong.

It has high strength and corrsion **resistance.**

Cereamic fibers:-

Sustain high temperature applications.

Boron:-

Boron fibers are high stiff, high tensile and compressive strength.

Epoxy:-

High strength and modulus.

Low level of volatiles.

Excellent adhesion.

Low shrinkage.

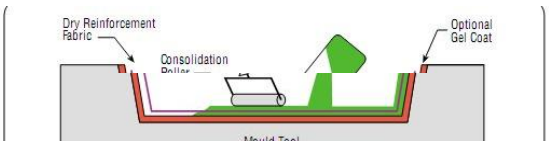
Good chemical resistance.

V. COMPOSITE VERSES METAL COMPARISION

Condition	Comparative behaviour releative to metal
Load strain reletaionship	More linear strain to failure.
Notch sensitivity Static Fatigue	 Greater sensitivity Less sensitivity
Transverse properties	Weaker
Mechanical properties	Higher
Fatigue strentgh	Higher
Sensitivity to hydrothermal environment	Greater
Sensitivity to corrsion	Much less

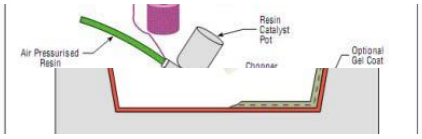
VI. COMPOSITE MANUFACTURING PROCESSES

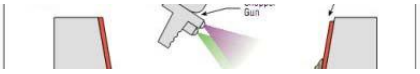
Wet Layups or hand lay up:-



In that type of manufacturing process used dry resistance fabric, Resin etc. In this process firstly added resin material after that spread over that fabric material. In this process we make an orientations ninty degees and fourty five degrees also.

Spray Lay up:-

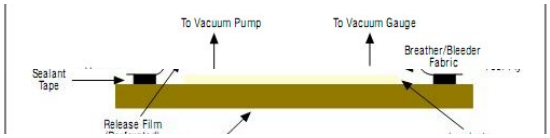


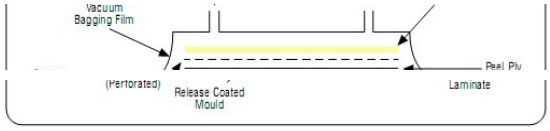


In this type of manufacturing procees used air pressured resin, fibers and optical gel coat etc. this type only used in manual making of composite materials and their thickness is very thins.

Vacuum Bagging:-

In this type of manufacturing process used vaccum bagging film, vaccum pump, vaccum gauge, peel ply, laminates, release coated mould, release films, sealent tape, breather fabric etc.





Defects during Manufacturing of composite materials:-

Incorrect state of resins, especially that resulting from variations in temperatures in thick or complex sections during autoclaving.

Incorrect overall fibre orientation and volume fraction.

Misaligned or broken fibres.

Non-uniform fibre distribution, with resultant matrix-rich regions.

Gaps, overlaps or other faults in the during arrangement of plies.

Voids in matrix-rich regions.

Distroyed bonding interlaminar regions.

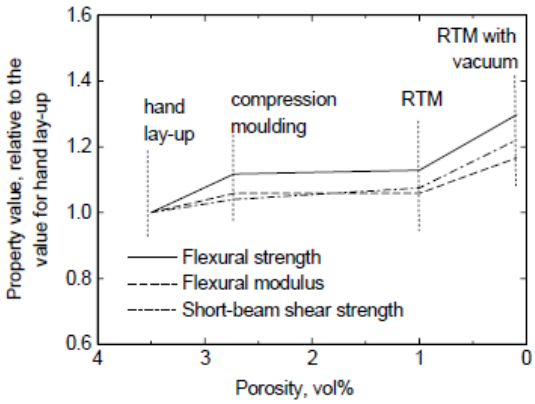
Resin cracks or transverse ply cracks resulting from thermal mismatch stresses.

Disbonds in thermoplastic composites resulting from failure of separated flows to re-weld during moulding.

Mechanical damage around machined holes

Local bond failures in adhesively bonded composite components.

Varations in Mechanical Properties during different manufacturing process:-



Nod destructive Inspection (NDI) of composites:-

Visual Inspection:-

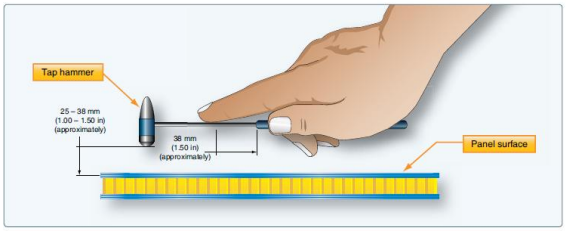
In that found damage scratch, strain, depenetrate, abrade or chip on composite materials. Damaged arear defected by suing magnifying glass, mirriors, borescopes.

Audible Sonic testing:-

In this used frequency rangein audible format 10hz to 20hz. By using this method inspected area of defects with solid round disc or light weight hammer like device and listning to the response of the structure to the hammer.

Automated tap test:-

This test is very similear to above only difference is that here we can use manual tap test except that a solenoid is used instead of hammer.



Ultrasonic Inspection:-

This type generally used for detection of internal delaminations, voids or inconsistance in composite components. In that used ultravoilet light waves.

Pulse echo ultrasonic inspection:-

In this method single search unit is used as transmitting & reciving transducer that is excite by high voltage pulse.

REFERENCES

[1] RSC, Advancing the chemical science. Composite materials page no 1 of 3. Index 4.3.1.

[2] ASM Internationa,Structrual composite materials, F.C. campbel 2010.

[3] Advanced composite materials by science engineering in materials.

[4] Dr. P.M. Mohite, AE-681 composite materials.

[5] Bryan Harris by Engineering composite materials, the institute of materials Landon, 1999.

[6] N.D. patil, Analysis of carbon fiber epoxy composite leaf spring in IJSRD, vol II, Issue 12, 2015, ISSN 2321-0613. Feb. 2015.

[7] N.D. Patil, Review of composite materials mono leaf spring in IJETAE, Vol IV, Issue 5, ISSN-2250-2459,May 2014.

[8] Vinkel Arora, Gian Bhushan and M.L. Aggarwal :- EYE DESIGN ANALYSIS OF SINGLE LEAF SPRING IN AUTOMOTIVE VEHICLES USING CAE TOOLS.