

High Temperature Adhesive: Eccobond-104

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Abstract

Eccobond 104, a high temperature epoxide adhesive is used for bonding porous/nonporous materials. e.g. 1. Metals preferably Aluminium, Carbon Steel, Stainless steel, brass carbon steel, 2. Ceramics, 3. Plastics, 4. Metalized carbon to steel, 5. PTFE, 6. Glass, 7. Thermo set. Various process shops have dealt with the properties, preparation, application, curing and inspection of Eccobond 104A/104B. The present paper takes in to count various requirements of preparation, application, curing and testing of the adhesive. In the present study, which is based upon Various practices followed by different organizations in the world and author's own experience of working with this high temperature adhesive. After curing the adhesive retains good strength up to 220deg C. The shear strength is found to be :

Index terms— various requirements of preparation, application, curing and testing.

1 Preparation a) Batching

The following procedure and precautions are required to be taken while doing the batching.

i. The liquid must be taken from a container which has been stirred to counteract "layering". ii. The powder must be taken from its container under dry conditions because it is highly hygroscopic and will deteriorate. iii. The mix ratio by weight is to be:

? 64 parts of part "B" ? 100 parts of liquid "A" iv. The quantities sufficient for normal work load batches, should be repacked in new containers, preferably not less than 39 gms of part "A" and 25 gms of part "B" in order to ensure proper proportioning. v. The screw top glass bottle for the powder should be of size that will hold 25 to 40 gms when completely filled. The container for the liquid must be of such a size that will be 1/3 rd full when it contains the exact amount of part "A", necessary for correct mixing ratio. vi. Each item is to be sealed, dated and identified including co-relation of paired container. vii. From each new incoming batch of materials, a sample is to be mixed and used for testing as per the prescribed procedure.

2 b) Mixing

Mix thoroughly to a smooth flowing consistency. Care is to be taken to ensure that whole bottle of powder is added to the associated liquid and none is lost. It may be noted that finely divided powder is easily blown about. Warm the mixture to 60 deg C (approx) to improve the flow characteristics.

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3 Introduction

ccobond 104 is supplied in two parts, part A is liquid and part B is fine powder . This is supplied in sealed container having not more than 1 litre and 1 kg of part 'A' and part 'B' respectively. Part "A" is liquid and is available in three viscosities: Standard Grade : 30,000 to 40,000 cps.

4 Filled Grade

: 50,000 to 60,000 cps.

Putty Grade : 750,000 to 85,000 cps.

Unless otherwise stated, standard grade part 'A' is to be used for all applications. In sealed containers, under dry conditions, the shelf life is 2 years. However the shelf life for the materials unopened, is indefinite provided the materials pass the laid down tests. This is a high temperature adhesive that retains good strength up to temperature of 220 deg C. The paper deals with application of this adhesive with particular reference to wide range of material that are frequently required to be bonded and thereafter are required to work under high temperature going up to 220 deg C. The paper explains in detail the methodology to be used for Preparation, Application, Curing, Handling and Inspection of test piece. This is lucid and handy document useful for all practicing Engineers technologists and industries where bonding of high temperature adhesive is a frequent requirement.

It is important to invert the tins Containing part "A" occasionally to ensure that resin does not settle too much. Weight out 100+1/2 parts "A", 64 +1/2 parts of part "B" Warm the mixture to 60deg C to help mixing. Mix thoroughly the two parts Ensuring that all particles of Powder are mixed mixed with Resin. (Eccobond 104 "B" should be sieved to separate the lumps of powder)

It is preferable to use disposable un waxed cups and wooden Spoon. Mix together to smooth consistency.

When mixed and while still warm, De-aerate by placing in a vacuum oven of 2 mm Hg or less. This is best carried out in vacuum oven held at 60 deg C. The mix will initially froth, and space must be allowed in the mixing cups, but after a few minutes the froth will collapse.

The mix should be held in vacuum for 30 min after collapse to ensure complete de-aerate. This mixture should be deaerated after every 6 hrs.

Thoroughly part "A" resin before using. c) Pot Life 24 hours minimum at 25 deg C. This time will be reduced at higher temperature.

5 d) Surface Preparation

This is carried out to produce a satisfactory adhesive bond.

i. The bonding should be carried out within 24 hours of surface preparation. Where this is impracticable, an additional degreasing operation immediately prior to bonding shall be carried out. The degreasing is to be done as per the process detailed for the appropriate material. If nothing is quoted, degrease process shall be ;

e) Operating Procedure-Metals and Alloys i. Aluminium and Al. Alloys Method -1 a) Degrease with trichloroethylene vapor as per the following sequence i) Immerse components slowly in vapour compartment(not in boiling Liquor) ii) Leave for 1-5 minutes according to weight of the components. A heavy component will require a longer time to attain the same temperature as the vapor, this is essential for complete degreasing. iii) Withdraw slowly.

6 b) Alternatively

Where vapor degreasing is impracticable, degreasing using clean liquid trichloroethylene is permissible.

1. Abrade the surface with wet stone. Method -3 a) Chromate film to be given as per the approved method.

7 Method -4

This method is used for all aircraft structures and components where corrosion protection is required.

Anodise to appropriate chromic acid method of anodizing viz DEF-151 Type-2.

Note : The bonding should be carried out within 16 hours of anodizing if practicable. If for any reason it is practically not feasible to complete the bonding process within 16 hours, then the surfaces should be reactivated as per the following scheme.

8 Method -2 a)

and treat as follows ? Surfaces may be bonded up to 2 weeks after plating.

9 h) Steel, Corrosion Resistant Method

? Etch at room temperature with ferric chloride solution for 2 minutes. ? Rinse in cold water.

? Wipe, while wet , with damp cotton wool to remove any residue. ? Dry using clean kim wipe, hot air circulating oven or hand air drier.

? At this stage, the surface should be covered with a uniform film of water, i the water breaks occur, this

10 ?

Surfaces may be bonded within 2 months after plating. j) Nickel? Method ? (i)
? Degrease surfaces to be reactivated as per Para e) Method-1 clause a)
? Degrease surfaces to be reactivated as per Para e)
Method-1 clause a) ()F
? Surfaces may be bonded within 2 weeks after plating.
i. Silver Method -1
? Apply Argentoplatine with distilled or demineralized water. ? Rinse in cold distilled or demineralised water.
And stove dry at 100 deg C.

11 Method -2

Where ultimate strength is required:
? Passivate to appropriate specification.
? This method has minimum effect on contact resistance. ? Surfaces may be bonded within 24hours of surface preparation.
Surfaces which are Tin plated
? Metal (Tin) not suitable for adhesion.
? Locally remove the plating if plated.
? After removal Tin plating from the base metal, the surfaces may be prepared as per the method laid down for the base metal.

12 Magnetic Materials

? Dry hone or vapor blast.
? Vapor blast to appropriate spec.
?
Glass/ Plastics a. Glass ? Grind or short blast surface. Notes:
? This process should be carried out in a well ventilated area, where means of extraction are available for any health hazard. ? During operations (2), the apparatus should be designed with vapor cooling ring., as due to evaporation a concentrated solution will result. Stainless steel solution is suitable material for the cooling ring.

13 Caution

The above precautions to remove moist air are necessary because this solution reacts with water very readily ceases to be capable of etching.

14 Caution

Silicone rubber is not suitable for bonding with epoxy adhesive.

15 n) Painted Surfaces

Wipe the surfaces which are to be bonded with clean cloth soaked in SBP. Care must be taken to ensure that the surfaces which are not to be bonded should not be wiped.

16 i. Carbon

Abrade with 120 grit emery paper and ultrasonically clean to appropriate spec.

17 a. Ultrasonic Cleaning

This method specifies requirements for cleaning components with ultrasonic equipment which is designed for process where;
? The components are immersed in a tank containing a transmission fluid of either water or kerosene.

18 Application

? The adhesive will normally be applied to both contacting surfaces. However there will be cases such as plugging of blind holes where to avoid entrapment of air, an adequate pool of adhesive is to be applied to the hole only and excess is exuded by carefully pressing the plug to bottom. Preferred thickness of the layer of the adhesive is between 0.5 to 1.5 mm depending upon the requirement.
? With the aid of suitable fixture, bond with an overlap of 12.7/14.3 cms and the long edges parallel following the procedure as laid down in para 4 of this paper. ? When pulled on testing machine at a rate of loadin of 1.3/2.7 KN per minut, the joint is to withstand a load of 4.5 KN (1000 lbf.) without failure. ? Pulling of test piece shall be carried out by Physical testing lab under the supervision of quality control deptt.

145 ? Assemble cylindrical parts with a twisting motion, if possible, to ensure joint coverage. Suitable fixtures
 146 must be used to ensure that the position of the parts is not disturbed. Viz mandrels, rods with spring loaded
 washers.¹



Figure 1:



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Figure 2: Process?F 1 ?



Figure 3:

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Figure 4:



Figure 5: ?



Figure 6: ??



Figure 7: ?

III.

? The container is partly immersed in tank containing a transmission fluid of either water or kerosene.

? This method is not suitable for Rubber/-Seals/Bellows/Bellow Assys/Impregnated electrical coil.

b. Abrading of bonded threads is not required. Surfaces 32 micro inches or inner surfaces,sharo edges must be protected against abrasion. Ensure complete freedom from abrasive particles before bonding.

[Note: c.]

Figure 8:

.1 ()

F surface tension will help the assembly to maintain concentricity and equalise the joint thickness. Flat joints to be arranged such as to maintain the parts in their relative positions but no pressure is to be applied except only light clamping.

IV.

.2 Curing

.3 Handling Precautions

? Avoid skin contact and inhalation of vapours. The use of barrier cream is recommended. ? Working area must be well ventilated and ovens extracted to outside atmosphere.

VI.

.4 Inspection

? Eccobond may break at 400 deg C. At this temp. It can cause distortion and change of properties. So, care must be taken for all these factors.

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When received, the parts 'A' and 'B' shall be passed through "Quarantine Inspection Deptt" to the laboratory. The laboratory shall repack the material as per para II. Preparation a) Batching ii. Identification of contents and correlation of paired containers to para II. Preparation a) Batching Para iv, v and vi must be clearly visible on each jar. Where the identification label is missing from a jar or not legible or the seal is broken, the contents must not be used.