

Carbon Adhesive ST-201

"This product is an adhesive developed for carbon materials.

1. outline

Carbon adhesive ST-201 is a high-strength, heat-resistant adhesive developed for carbon materials, and has the following features

By carbonizing the adhesive itself, it is possible to bond carbon materials without compromising their excellent properties.

The bonded carbon products maintain their strong bonding strength up to high temperatures (3000° C in an inert atmosphere).

Various carbon materials can be bonded. The main materials to be bonded are isotropic graphite materials, graphite extrusion materials, and C/C composites.

2 Bonding method

(1) Bonding surface processing and cleaning

(1) Processing and cleaning of the bonding surface The bonding surface should be processed so that it matches as closely as possible. It is recommended to finish the surface with #400 sandpaper.

Next, clean the adhesive surface of any graphite powder or dirt that may have adhered to the surface. Air blasting or wiping with a cloth soaked in alcohol is effective. If alcohol or other solvents are used, be sure to dry them thoroughly.

(2) Adhesive application

Apply the adhesive thinly and evenly to both sides to be bonded with an appropriate tool, such as a spatula. The appropriate amount to apply is about 20 to 30 mg/cm². If the viscosity is too high to handle, it can be diluted with a small amount of methanol. The amount of methanol to be added should be no more than 3% by weight.

Follow the steps below.

(1) Adhesion processing and cleaning

(2) Adhesive application

(3) Adhesion hardening

(4) Baking

Handling should be done in a well-ventilated area, and protective gloves and masks should be worn.

(3) Adhesion curing

Press together so that the adhesive layer becomes as thin as possible. Ideally, the thickness of the adhesive layer should be less than 50 μ m. If the bonding area is large, it is recommended to use a clamp or the like for crimping. Dry the pressed material at 80° C for at least 4 hours and at 120° C for another 4 hours, keeping it as still as possible. This is the drying stage for some solvents.

After that, slowly raise the temperature to 200°C and hold it for 1 hour to cure.

Since there is degassing during the drying and curing stages, the longer the drying time, the higher the strength of the bond, especially for dense materials such as isotropic graphite. Use the drying and curing conditions in Table 1 as a guide.

表 1. 熱処理条件

等方性黒鉛の 高密度 [g/cc]	熱処理条件
1.8	80℃・4Hr→120・4Hr→20～25℃/Hr→200℃・1Hr
2.0	80℃・8Hr→120・4Hr→5～10℃/Hr→200℃・1Hr

(4) Sintering

After heat curing is completed, the material still contains volatile components, so bake it in vacuum or inert gas according to the operating temperature. In this case, take care not to raise the temperature too rapidly, as degassing may occur. For an isotropic graphite material with a bulk density of 1.8 [g/cc], use a temperature of 40° C/Hr or less as a guide.

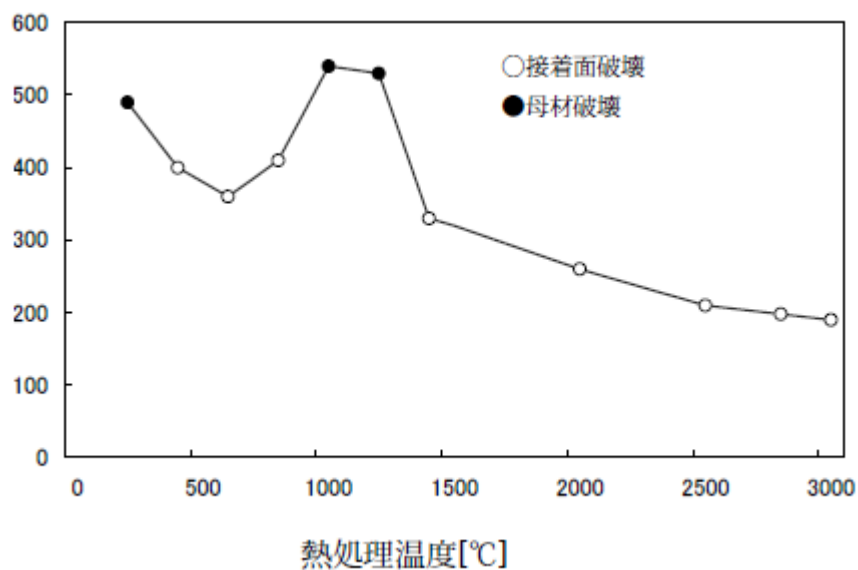
3. adhesion strength

(1) Bonding of isotropic graphite materials

Figure 1 shows the bonding strength of two 10 x 10 x 50mm pieces of isotropic graphite material (1.8[g/cc]) bonded on a 10 x 10 mm surface and treated to various temperatures.

Adhesion strength is measured at room temperature by applying a load to the bonded area with a span of 40 mm and a three-point bending strength.

200℃ is the result of heat treatment in air and above in Ar gas.

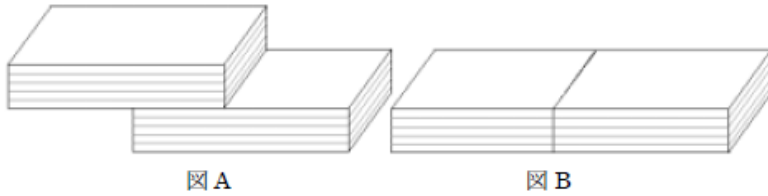


Bending strength dependence of the heat treatment temperature

(2) Bonding of C/C composite

C/C composites are glued together, carbonized at 1000° C, and then each property is measured at room temperature.

- ① Tensile shear strength: 70kg/cm² (breaking at a point other than the bonded surface)
- ② Tensile strength: 50kg/cm²
- ③ Bending strength: 150kg/cm²



Here, ① is the data of bonding on the laminated surface as shown in Figure A, and ② and ③ are the data of bonding on the fault as shown in Figure B.

The C/C composites are AC-200-B05 and AC-200-B10 made by Across Corporation.

4. electrical conductivity

Figure 2 shows the bonded electrical resistance ΔR (see next section) at room temperature when two 10 x 10 x 50 mm isotropic graphite materials were bonded using ST-201 and heat-treated at various temperatures.

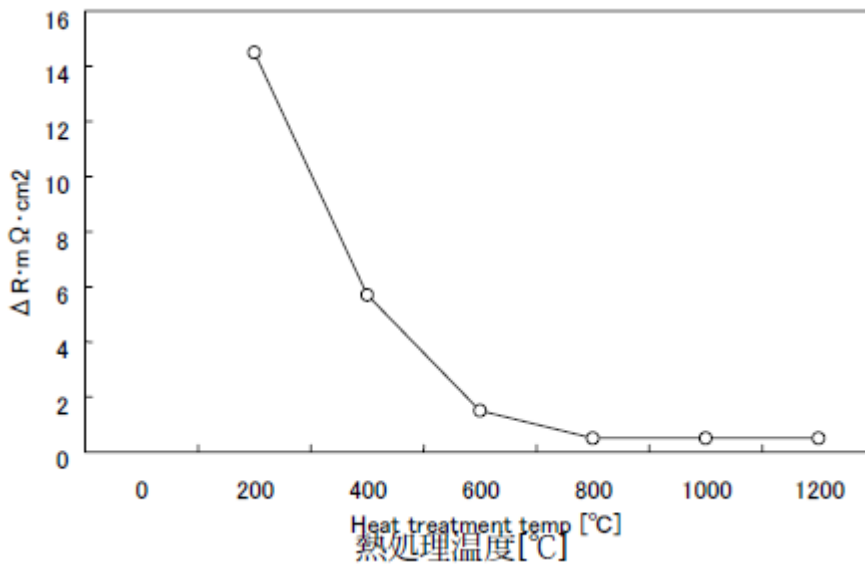


Fig. 2 Relationship between heat treatment temperature and adhesive electrical resistance

The adhesive resistance, ΔR , was calculated using Equation (1) from the electrical resistance values shown in

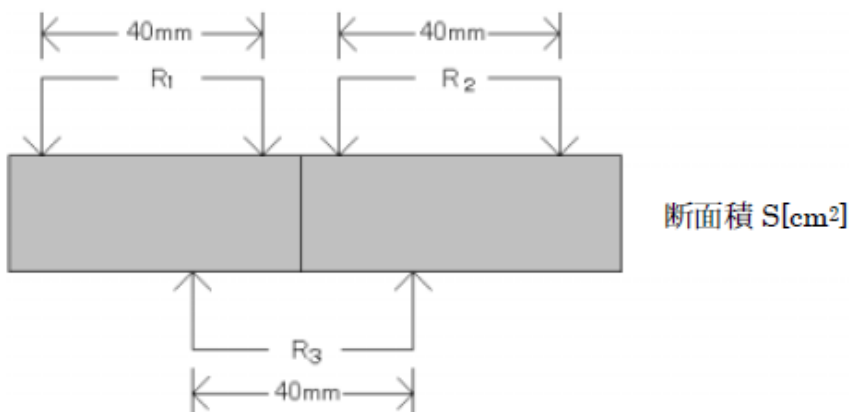


Figure 3: Method of measuring adhesive electrical resistance

$$\Delta R = \{R_3 - (R_1 + R_2)/2\} \times S \cdots (1)$$

where R_1 , R_2 , and R_3 are electrical resistances calculated by measuring the voltage drop over a 40 [mm] length when a current of 1 A is passed through using the four probe method.

5. caution

This product is a non-medicinal deleterious substance.

This product is a non-medicinal deleterious substance and should be handled properly in accordance with relevant laws and regulations.

If this product is not to be used for a long period of time (more than one month), store it in the refrigerator.

If the product is not to be used for a long period of time (more than one month), store it in the refrigerator. If it is to be used, return the temperature to room temperature before opening the bottle.

The product should be stirred well before use.

When handling, keep away from fire in a well-ventilated area and wear protective equipment.