

The Bonding Method of C/C Composite Material

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Introduction

C/C composite material has good properties at high temperature, it is usually used to make the products used in the environment of high temperature, such as the throat of missile, plane carbon brakes etc.. C/C composite material is expensive for its long period and high cost of production. The cost can be lowed by reusing the repaired C/C composite material products. This paper studied a new bonding method of C/C composite material. Using this method, it will come to be fact to reuse the worn out C/C composite material products that can endure in a high temperature.

Experiment

The bonded sample is 2-D C/C composite material. The experiments with the different adhesive and different process factors were made to select the right adhesive and factors. The mechanic properties of the bonded samples were tested in room temperature and an alternating temperature.

Results and discussion

1 Select the right adhesive and process factors

Four different adhesive (A1, A2, A3, A4) and four different process factors(F1, F2, F3, F4) are selected to do process experiments. The results indicate that the process factors is more important than the adhesive, the condition of adhesive A1 and process factor F1 is the best of them.

2The mechanic properties of the bonded C/C composite material

2.1 Properties in room temperature

Compression strength and bonding interface inter-laminar fear strength (ILSS) of the bonded samples were tested. The results compared with that of C/C composite material that not been bonded were reported in table 1.

Table 1 tells that the bonded sample's mechanic properties are higher than that not bonded, and the improvement of ILSS is more remarkable than that of compression strength .The reasons were summarized as following:

----The bonding process is helpful to improve the mechanic properties of C/C composite material

----In the testing of ILSS, not only the bonding interface was destroyed, but also the carbon fibers in the sample was damaged.

Fig.1 shows a metallograph of the sample's bonding section , and a SEM photo of a shear damaged sample's section is shown in Fig.2.

2.2 Properties in alternating temperature

Put the samples in an alternating temperature: room temperature for 3 minutes, then 1100°C for 3 minutes. Repeated it again and again, then tested the samples. The samples' bonding interface ILSS is 10.9 MPa, and its compression strength is 108.9MPa.

Conclusion

C/C composite material can be bonded with adhesive A1 and process factor F1. Its compression strength and

bonding interface ILSS are higher than that of C/C composite not bonded. Bonded C/C composite products can be used in an environment of high temperature and

alternating temperature. It is a good method for the worn out C/C products to be reused.

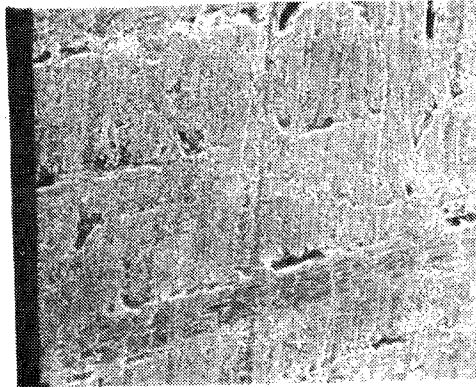


Fig.1 Metallograph of the sample's bonding interface



Fig.2 SEM photo of a shear damaged sample's section

Table 1 Properties of the bonded and not bonded C/C composite material

	ILSS (MPa)	Compression strength(MPa)
C/C bonded	10.9	109.7
C/C not bonded	4.2	82.8