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SHORT COMUNICATION

Variation of sizing content in different samples of carbon fiber yarn

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Abstract: Sizing optimizes the processability of carbon fiber. Although sizing is a small percentage of fiber reinforced composites -normally 0.5 - 5% of its weight- it affects the production and the processing of the fiber, and has a significant impact on the interface properties between the fiber surface and the composite matrix.

Keywords: composites, epoxy, carbon, sizing, prepreg

1. INTRODUCTION

It is known that the different types and quantities of size can modify the surface properties of the carbon fiber, as well as the wettability and chemical reactions with epoxy matrices. The size layer will necessarily have an impact on the physico-chemical interactions between the carbon fiber and the resin, and subsequently the interface/interphase properties of the composite.
In this preliminary study the nature of the sizing on a sample of T700S carbon fiber yarn is determined, and then we proceed to quantify the percentage difference in sizing from samples of T700S carbon fiber taken from different spools of yarn, from the same industrial supply.

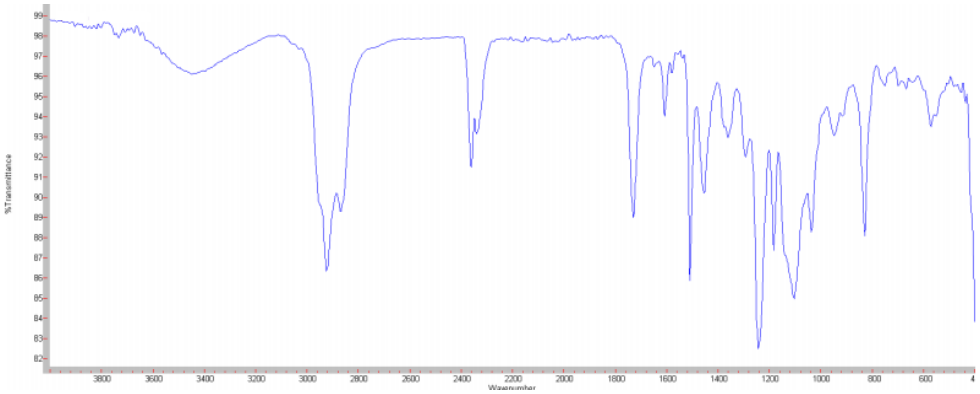
2. MATERIAL AND METHODS

Raw fiber: Carbon Fiber T700S;
Type of size declared by the supplier: Epoxy;
Quantity of size declared by the supplier: 1%.

The nature of the size present on the yarn was determined by infrared spectroscopy, performed on the sample extract. A yarn sample is left to soak for 24 hours in dichloromethane. The infrared spectrum performed on an extract of the sample highlights the presence of epoxy resins. (Figure 1).
The amount of size on 4 different yarn samples was determined by TG/DTA analysis, with a ramp of 20°C/min, from 30 to 400°C, on samples previously dried at 80 °C for 4 hours. (Table 1).

3. RESULTS AND DISCUSSION

Figure 1



The analysis of the peaks of the spectrum obtained with FT-IR analysis can be easily associated with the presence of epoxy resins.

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Table 1

Temperature °C	Weight loss % Sample 1	Weight loss % Sample 2	Weight loss % Sample 3	Weight loss % Sample 4
100	0.09	0.11	0.10	0.10
200	0.20	0.31	0.30	0.28
300	0.90	0.60	0.59	0.76
400	1.56	1.01	1.11	1.24

Standard deviation among the final weight loss percentages (σ): 0.20

It can be seen that the material undergoes a relatively slight weight loss as the temperature changes. The data show that the total weight loss is around 1-1.5%. However, it is not certain that this weight variation is completely attributable to the degradation of the size. Moisture molecules or other types of impurities may still be present.

4. CONCLUSION

A sizing agent which improves the affinity between sized fiber and matrix resin to firmly bond the fiber and resin has been demanded in the field of fiber-reinforced composites. In this regard, prepreg manufacturers should evaluate the influence that the variation in size content between one batch and another of yarn can have on the properties of carbon fiber fabrics, carbon fiber prepregs, and carbon laminates.

REFERENCES

Comparison of sizing effect of T700 grade carbon fiber on interfacial properties of fiber/BMI and fiber/epoxy December 2012Applied Surface Science 263:326–333 DOI:10.1016/j.apsusc.2012.09.054