Effect on tensile testing of hybrid fiber composites

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Abstract. This paper provides tensile testing and analysis at the hybrid fiber model composites mechanical process measuring. In this study, tensile tested of hybrid fiber composites was accomplished using a mechanical high-efficiency propeller technology. This research result suggests that the tensile testing of hybrid fiber composites acquired for horizontal direction length is a eliminated gravity influence factors measurement as a representative strength. The mechanical technique is validated by comparison with results from a similar tensile tested using several groups specimens. Surprisingly, double-fixtures only severe affects the results.

1. Introduction

The effective of tensile tested on representative strength of hybrid fiber composite is one of the high performance fibers used in the advanced composites[1-9]. In this study, demonstrated a complex combination of tensile testing modes, such as hybrid fiber composites breakage, tension, displacement and elongation. In studying the effects of the horizontal direction length tensile tension and displacement loads of supported hybrid glass fiber/nano-carbon fiber composites. Bader MG et al. found that up to 40% tensile tested strength increase and 50% failure tension increase could be obtained in hybrid glass fiber/nano-carbon fiber composites [7-10].

The present study aimed to experimentally and trial sub stage used horizontal direction length tensile stress against strain assess the effect of hybrid fiber composite properties and its mode of succeed at room temperature.

2. Experimental

2.1 Materials.

Hybrid fiber model composites based on American Society for Testing Material (ASTM) D638 Standard. The specimens were used as dumb bell sample material. Physical and mechanical parameters of hybrid fiber composites are presented in Table 1.

Table 1 Mechanical parameters of hybrid fiber composites tested

Tested code	Tested speed (mm/min)	Specimens length (%)	Tension region[a] (*N*)	Displacement region[b] (mm)
Tensile testing (a)	20	L_1/L_3 =0.3	0~25	0~1.0
Tensile testing (b)	20	L_1/L_3 =0.4	0~10	0~0.8
Tensile testing (c)	20	L_1/L_3 =0.5	0~6	0~0.6

[a] Tension region and [b] Displacement region were the break roughly region.

The specimen with 2D perspective view is shown in Fig. 1, where is the width of tensile testing,is the width of specimen, oris the transitional fillet radius and d is the width of fixed position. Gague length (L_3) ,width (W) of the specimens were 160mm (L_2=80mm,L_1=48mm), 25mm. Specimens were assembled with three different lengths (L_1/L_3=0.3, 0.4 and 0.5).

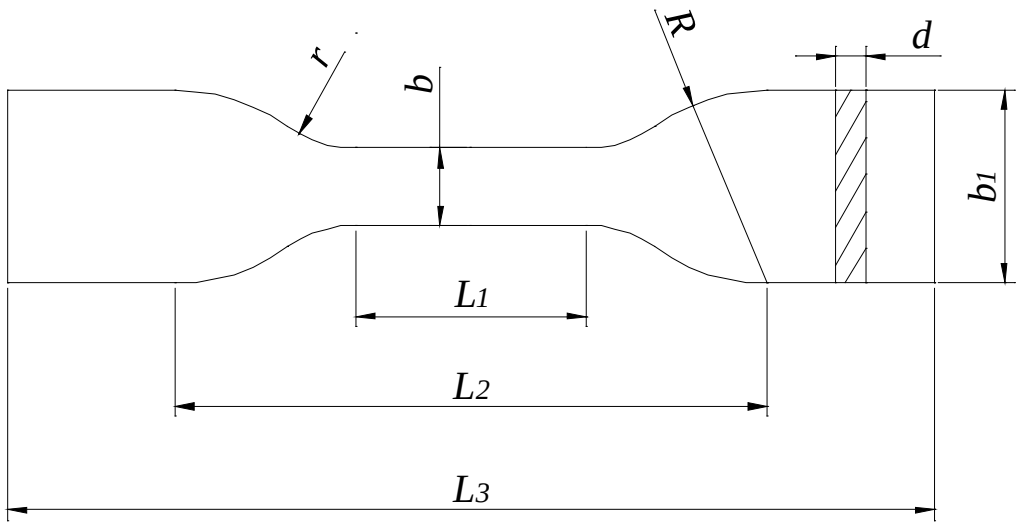

Fig.1 Specimen with 2D perspective view

2.2 Sample perparation.

The processing was performed in a equipment shown in Fig. 2. Mechanical treament specimens were prepared by dumb bell sample of hybrid fiber composites in this machine at room temperature. Gauge with a length of 160.0 mm in temperature box central region of the specimens was clamped as the tensile tested target zone, and the CCD digital camera perpendicular to clamp of the specimens fixture range.

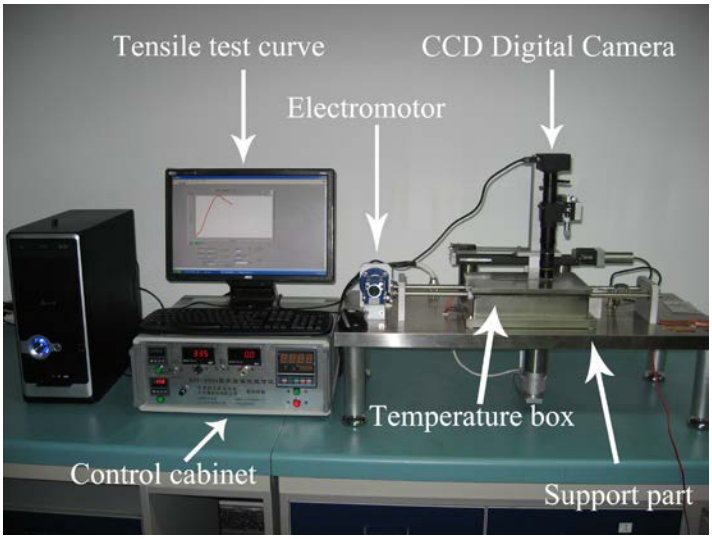

Fig.2 Specimens in the tensile test fixture

2.3 Specimens tensile testing.

Tensile tested of hybrid fiber composites conducted on specimen, double-fixture, transmission shaft, etc. For this, the specimens were prepared tested the identical hybrid fiber model composites and the tensile tested speed is around 20mm/min.

For this research, the hybrid fiber model composites acquired for horizontal direction length is a eliminated gravity influence factors measurement. A specimen being tensile tested double-fixtures with 3D perspective view is given in Fig. 3.

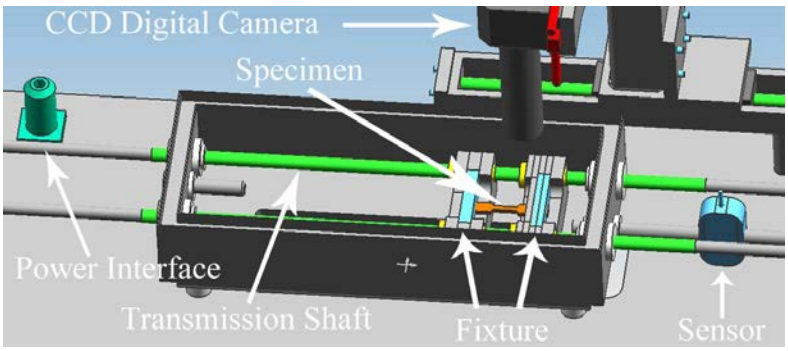

Fig.3 Schematic of the specimen tensile test set up

3. Results and discussion

Fig.4 shows the tension-displacement curves obtained for control cabinet by computer. The resulting break of tension and displacement hybrid fiber composites are dependent on factors on such as control voltage, tensile tested speed, and electric properties of the polymer solution [10,11]. A typical mechanical measurement of central double-fixtures ensuring that the maximum strain in the specimens does not exceed 0.5% for 360 s.

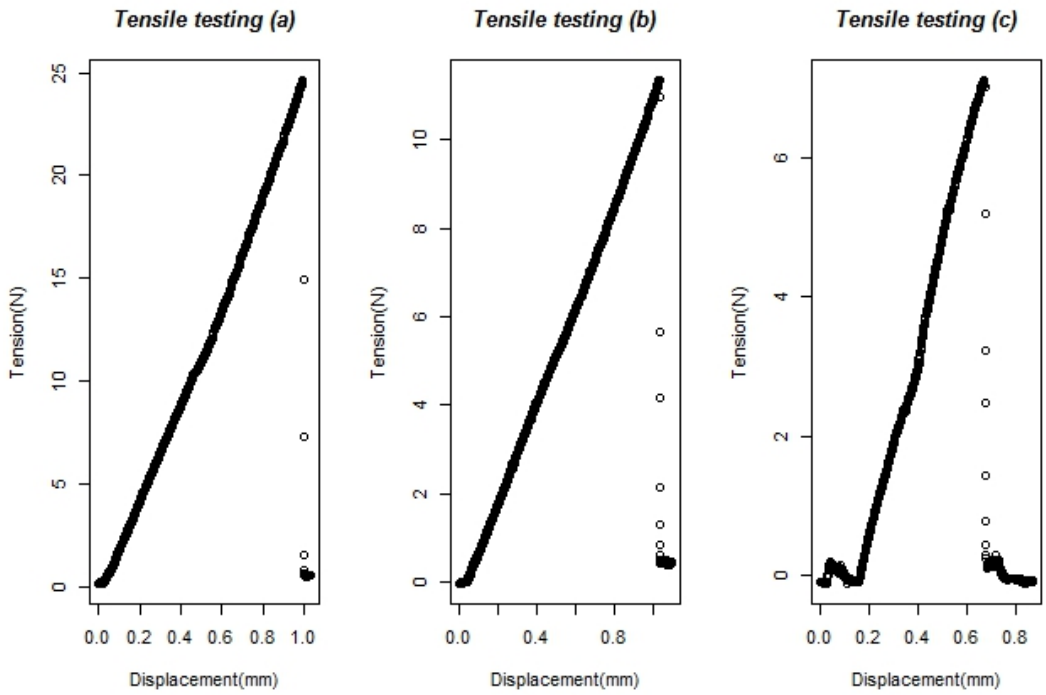

Fig.4. Plots of tension against displacement for tensile testing of hybrid fiber composites

Hybrid fiber composites were found to exhibit a tensile tested modulus of 100±20 Mpa, tensile strength of 25±15 Mpa, tension at break of 100±100% tension. The specimens mechanical properties were found to change with hybrid fiber composites width () and thickness. Tensile strength and yield stress at a level of significance of 0.05 given for the study by E.P.S. Tan et al.[13] Tensile tested speed decrease and width or thickness increase, both tensile tested tension and displacement with increase. Tension against displacement aggregation curves are shown in Fig. 5.

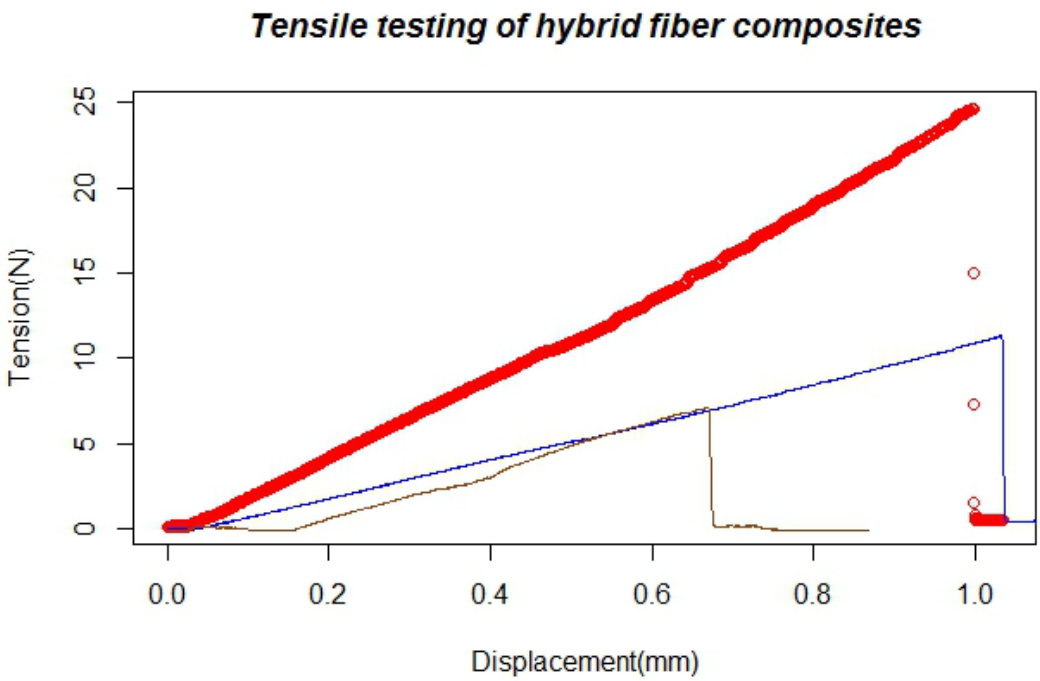

Fig.5 Tension against displacement aggregation curves of hybrid fiber composites. Specimens are break around by 25 N(a), red; 10N(b), blue; 5N(c), chocolate4.

4. Conclusions

A effective method of fixture hybrid fiber composites and preparing horizontal direction length of dumb bell specimens for tensile tests has been demonstrated here. The mechanical properties were found to be dependent on hybrid fiber composites width (, as shown in Fig. 1) and specimen thickness. Double-fixtures reverse tensile tested of horizontal direction length is a eliminated gravity influence factors measurement as a representative strength, and thus the desired mechanical properties for tensile testing of hybrid fiber composites.

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