TENSILE PROPERTIES OF NOVEL COMPOSITE ROPES

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Abstract: Novel carbon/glass hybrid thermoplastic composite rods have been developed, and they consist of PAN-based carbon fiber, E-class glass fiber, and thermoplastic resin. Three types of hybrid rod with different carbon/glass ratios were fabricated. In the previous studies, the morphology of the hybrid rods was observed and the volume fractions of the carbon fiber, glass fiber, matrix, and voids for the hybrid rods were estimated using a thermogravimetric analysis and specific gravity measurement via ethanol immersion. The tensile properties of the hybrid rods were also characterized. Additionally, it is necessary to characterize tensile properties of the hybrid ropes to understand the mechanical properties. In the present work, tensile properties of the hybrid ropes consist of hexagonally close-packed rod with two layers (seven rods) were investigated. The stress applied to the specimen was almost linearly proportional to the strain until failure for all hybrid ropes. The tensile modulus and strength of the hybrid ropes were ranged 60-79 GPa and 1.32-1.76 GPa. The tensile modulus and strength increased with increase in volume fraction of carbon fiber. The Weibull statistical distribution of tensile strength for the hybrid ropes was examined. The Weibull modulus of the tensile strengths for the hybrid ropes were ranged 31.61-42.83. The Weibull modulus increased with increasing tensile strength of the hybrid ropes.

Keywords: carbon/glass hybrid, thermoplastic, rope, tensile property, Weibull modulus