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Effects of off-axis angle on shear progressive damage of
3D woven composites with X-ray micro-computed tomography

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Abstract: This paper presents the influence of the off-axis angles on the shear progressive damage of three-dimensional (3D) woven carbon/epoxy composites. Five kind of samples with different angles, 0°, 30°, 45°, 60° and 90°, of the weft and warp yarn orientation are experimentally tested via short beam shear method. X-ray micro-computed tomography (Micro-CT) techniques are employed to identify the internal damage initiation/evolution of 3D woven composites. Results indicate that the off-axis angles have significant effects on the mechanical behaviors, damage change and final failure mechanisms. Furthermore, the ultimate strength of on-axis samples are mainly influenced by the yarn tensile fracture and delamination, whereas those of off-axis samples are largely governed by the debonding and yarn pull-out breakage.

Keywords: A. 3-Dimensional reinforcement, B. Mechanical properties, C. Damage mechanics, D. CT analysis

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