

Effect of Fiber Structure on the Strength of CFRTP Injection Molded Parts

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In the automotive industry, increasingly stringent regulations on greenhouse gas emissions have driven the demand for lightweight materials, promoting the use of carbon fiber reinforced thermoplastics (CFRTP). While injection-molded CFRTP is suitable for mass production, its mechanical properties often vary due to changes in fiber structure caused by molding conditions, leading to challenges in ensuring stable quality. This study investigates the fracture mechanisms and strength-determining factors of injection-molded CFRTP using long- and short-fiber pellets. Bending test results showed that long fibers exhibited higher strength at a carbon fiber (CF) content of 10 wt%, whereas short fibers showed higher strength at 20 wt%. Fracture analysis revealed that crack propagation is governed by resin fracture and interfacial debonding between CF and the matrix. In addition, detailed evaluations of fiber orientation, fiber length, and fiber distribution were conducted to clarify their relationship with mechanical properties. Furthermore, fiber length dominates strength at 10 wt% CF, while fiber distribution becomes the dominant factor at 20 wt% CF.

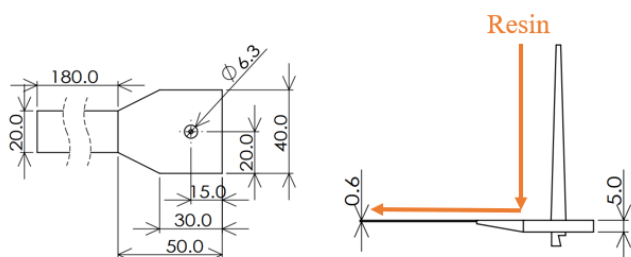


Fig.1 Injection molded specimen

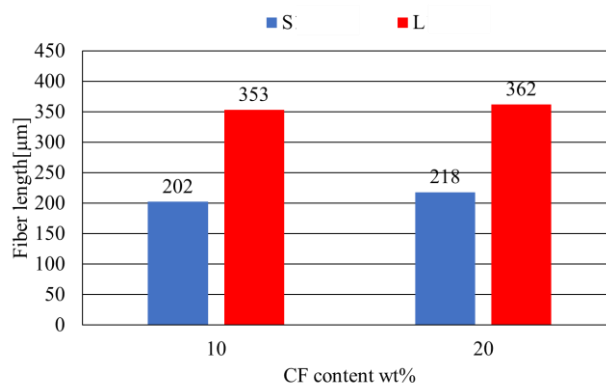


Fig.3 Fiber length

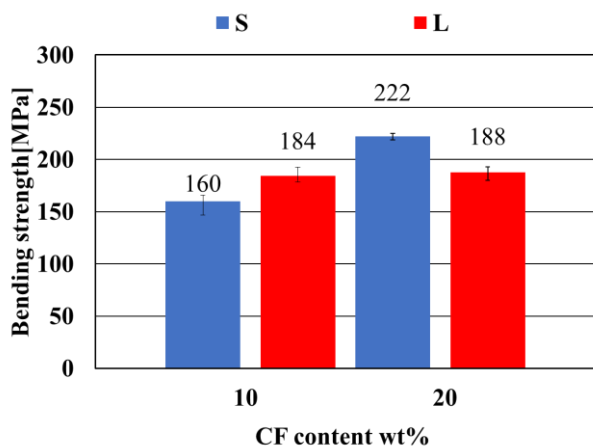
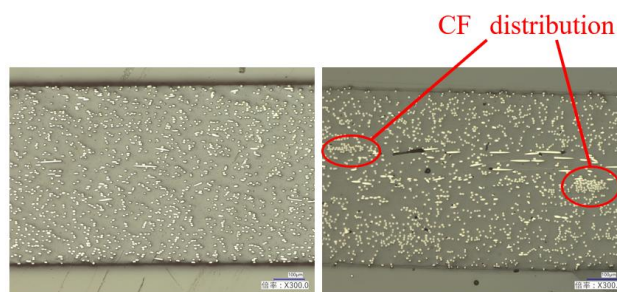


Fig.2 Bending test results
(L, Long Fiber/S, Short Fiber)



20wt% CF content
(Left: Short Fiber / Right: Long fiber)
Fig.4 Cross-section observation results