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Design optimization and manufacture of hybrid glass/carbon fiber reinforced composite bumper beam for automobile vehicle

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Abstract

In this study, the hybrid glass/carbon composite bumper beam was designed and manufactured via the design optimization process combined with the impact analysis. The glass/carbon mat thermoplastic (GCMT) composite was devised to substitute for the conventional glass mat thermoplastic (GMT) for reducing the weight of bumper beam. For the design optimization, the mechanical properties of GCMT were predicted and the optimal design of bumper beam was performed with the impact simulation. Based on the final design, the real bumper beam was manufactured and its impact performances were measured. It was found that the optimally designed GCMT bumper beam had 33% less weight compared to the conventional GMT bumper beam while having the improved impact performances.

Keywords: Fiber reinforced composite, Hybrid glass/carbon fiber composite, Impact simulation, Finite element analysis, Optimal design.

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