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Analysis of Tensile Behavior After Impact in Low Temperature Environmental Conditions for Self-reinforced PET Composites

Abstract: Self-reinforced polyethylene terephthalate (srPET) is a self-reinforced composite material composed of PET fiber reinforcement and a PET matrix. Compared to conventional PET polymers, it offers specific strength and impact resistance, and it can be applied to internal parts that require lightweight and impact resistance properties in sports equipment, UAM, vehicles, etc. However, srPET uses polymer-based reinforcement to greatly affect the strength characteristics and interfacial bonding characteristics caused by impact damage. Therefore, in this study, in order to examine the usability and durability of srPET as an internal component, the change in the fracture mechanism was analyzed by performing the mechanical characteristics of srPET composite according to impact damage under various environmental conditions. Additionally, microstructural analysis via Scanning Electron Microscopy (SEM) and Optical Microscope (OM) is performed to elucidate the mechanisms underlying mechanical property restoration. The degree of recovery is correlated with the re-forming conditions, highlighting the critical role of optimal temperature and pressure settings, with key factors contributing to the restoration of mechanical properties observed through microstructural analysis. The implications of these findings suggest potential applications in automotive, aerospace, and structural engineering, where material resilience and longevity are paramount. Future work will focus on refining re-forming parameters and exploring the long-term durability of re-formed srPET composites under cyclic loading and environmental exposure. The study underscores the transformative potential of re-forming techniques in enhancing the performance and sustainability of composite materials in advanced engineering applications.

Keywords: Self-reinforced PET composites, Environmental conditions, Recovery, Mechanical properties.

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