Enhancing the Recyclability of Polycarbonate: The Effect of Carbon-Based Nanomaterials and Glass Fibres

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The demand for thermoplastics has continued to rise since World War II, largely due to their versatility, lightweight nature, and ease of production. These materials have increasingly replaced metals and other traditional materials in industries ranging from food packaging to automotive manufacturing. However, unlike metals, thermoplastics pose significant challenges in terms of recyclability [1]. According to the OECD, only approximately 10% of thermoplastics are effectively recycled [2]. A major issue is the degradation of polymer chains during recycling, which adversely affects the material properties of thermoplastics, leading to a reduction in mechanical performance and limiting their reuse potential.

This study explores the use of carbon-based nanomaterials in polycarbonate to improve recyclability and mechanical performance. By adding nano-reinforcements and glass fibres, we aim to reduce property degradation over multiple recycling cycles. Polycarbonate composites undergo five recycling processes, with assessments of tensile strength, thermal stability, and structural integrity. Our goal is to identify the optimal additive composition for preserving material properties. This research addresses a key environmental challenge in thermoplastics by enhancing recyclability. The findings could advance sustainable materials science and improve recycling strategies for polycarbonate products.

References

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Figure

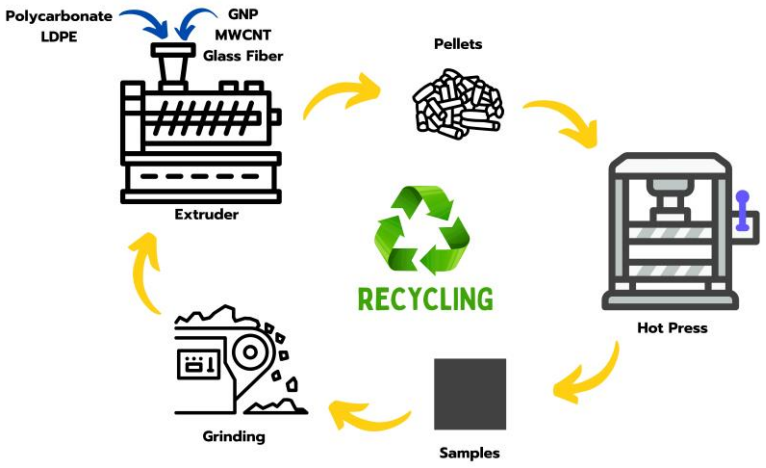

Figure 1: Recycling process for polycarbonate