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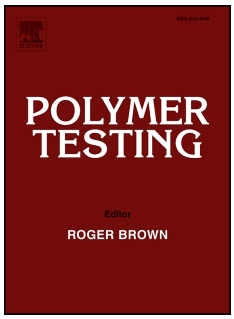

Design of toughened PLA based material for application in structures subjected to severe loading conditions. Part 1. Quasi-static and dynamic tensile tests at ambient temperature

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Material Properties

Design of toughened PLA based material for application in structures subjected to severe loading conditions. Part 1. Quasi-static and dynamic tensile tests at ambient temperature.

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Abstract

The suitability of a ternary composition 58 wt% polylactide (PLA) - 25 wt% poly(methyl methacrylate) (PMMA) - 17 wt% Impact modifier (Biostrong) for use in technical parts subjected to severe loading conditions was investigated. As a key point, its tensile behavior under high-strain-rate loading, for the moment at ambient temperature, was studied, which has not been done before for any PLA-based composition. Prior to dynamic tensile tests, it was verified that the appealing mechanical properties of PLA-PMMA-Biostrong composition previously achieved with material processed at laboratory scale are kept when the material is produced using industrial extrusion and injection processes. Finally, industrially produced PLA-PMMA-Biostrong composition showed high levels of tensile strength, rigidity and ductility for a wide range of strain-rate and is, therefore, suitable for use in highly-loaded technical parts.

Keywords

Polylactide; Toughening; High strain rate behaviour; Industrialization.

1. Introduction

Use of bio-based polymers, i.e. derived from renewable resources, is booming in many industrial sectors, in particular because of the willingness to reduce the dependency on petro-sourced materials, to improve the recyclability of products and/or to answer customer demand for more environmentally friendly materials. Among currently available bio-based polymers, polylactide (PLA) is undoubtedly one of the most promising sustainable alternatives to