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Abbas Niknejad, Alireza Moradi



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A novel solid cylindrical composite material made of agglomerated cork inserts and silicone rubber resin during the flattening process

Abbas Niknejad^{1,*}, Alireza Moradi¹

¹Mechanical Engineering Department, Yasouj University, P.O. Box: 75914-353, Yasouj, Iran

*Corresponding author. Tel.: +98 74 33229889; fax: +98 74 33221711.
Aniknejad@yu.ac.ir

Abstract

Present research work introduces a novel composite material consists of agglomerated cork inserts as the stiffener particles and silicone rubber as the resin and uses it as an energy absorber during lateral flattening process under the quasi-static lateral loading in the form of solid cylinder by the experimental method. Solid cylindrical composite specimens were manufactured with different agglomerated cork insert conditions consist of different insert shapes of cylindrical and cubic, different diameters and heights of cylindrical insert, and various insert densities. Also, some composite specimens were produced with two different insert patterns of arranged and random and with two different agglomerated cork insert mass fractions that called MAX and MIN conditions. Furthermore, the composite specimens were manufactured with three different specimen diameters. All the samples were laterally compressed between two rigid platens and their energy absorptions were investigated. Also, effects of all the above mentioned parameters were discussed. In addition, spring-back rates of the samples were studied to investigate probability of using the introduced composite as both of reversible and irreversible energy absorbers. Experiments show that in the MAX condition, composite specimens with cylindrical inserts have higher specific absorbed energy respect to the specimens with cubic inserts and with cork powder.

Keywords: Energy absorption; Composite material; Stiffener particles; Agglomerated cork inserts; Lateral compression.

1. Introduction

Environmental concerns have increased the demand for sustainable and recyclable materials used in different productions and applications. Therefore, study in such cases is expanding. Cork is one of those

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