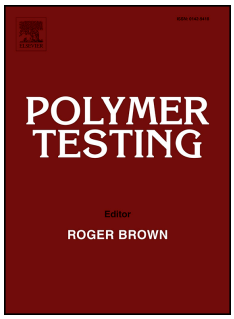
Accepted Manuscript



Novel strategy for the hyperelastic parameter fitting procedure of polymer foam materials

Attila Kossa, Szabolcs Berezvai

PII: S0142-9418(16)30333-6

DOI: 10.1016/j.polymertesting.2016.05.014

Reference: POTE 4659

To appear in: *Polymer Testing*

Received Date: 11 April 2016

Accepted Date: 17 May 2016

Please cite this article as: A. Kossa, S. Berezvai, Novel strategy for the hyperelastic parameter fitting procedure of polymer foam materials, *Polymer Testing* (2016), doi: 10.1016/j.polymertesting.2016.05.014.

Property Modelling

Novel strategy for the hyperelastic parameter fitting procedure of polymer foam materials

Attila KOSSA, Szabolcs BEREZVAI

Department of Applied Mechanics, Budapest University of Technology and Economics

H-1111 Budapest, Muegyetem rkp. 5., Hungary

Abstract

The most widely used approach to model the large strain elastic response of polymer foams in a finite element (FE) simulation is the use of the Ogden–Hill compressible hyperelastic material model. This model is implemented and termed as "hyperfoam" material model in the commercial FE software ABAQUS. The hyperfoam model is able to characterize the large compressibility (in volumetric sense) of the foam material. In order to find the material parameters of the model for a particular foam specimen, we need to fit the simulated responses to the available experimental data. This task is easier for incompressible hyperelastic materials because we can use the incompressibility constraint to eliminate the transverse stretch from the stress solutions. However, this simplification cannot be used for the hyperfoam model, therefore, in the stress-strain relations, the transverse stretch is included, which makes the parameter fitting procedure more complicated. In this paper, a novel strategy is proposed for the parameter fitting task. The performance of the new algorithm is demonstrated by presenting fitted material responses for a particular polymer foam material. The major advantage of the new strategy is that it can be used with any third-party optimization solver and there is no need to write our own code.

Keywords: hyperelastic; polymer foam; parameter fitting.

1. Introduction

The material behavior of solid polymers is highly nonlinear and various tests have to be