

Accepted Manuscript

Three dimensional quantification of anisotropic void evolution in deformed semi-crystalline Polyamide 6

Lucien Laiarinandrasana, Olga Klinkova, Franck Nguyen, Henry Proudhon, Thilo F. Morgeneayer, Wolfgang Ludwig



PII: S0749-6419(16)30044-4

DOI: [10.1016/j.ijplas.2016.04.001](https://doi.org/10.1016/j.ijplas.2016.04.001)

Reference: INTPLA 2038

To appear in: *International Journal of Plasticity*

Received Date: 12 October 2015

Revised Date: 1 April 2016

Accepted Date: 1 April 2016

Please cite this article as: Laiarinandrasana, L., Klinkova, O., Nguyen, F., Proudhon, H., Morgeneayer, T.F., Ludwig, W., Three dimensional quantification of anisotropic void evolution in deformed semi-crystalline Polyamide 6, *International Journal of Plasticity* (2016), doi: 10.1016/j.ijplas.2016.04.001.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Three dimensional quantification of anisotropic void evolution in deformed semi-crystalline Polyamide 6

Lucien Laiarinandrasana^{a,*}, Olga Klinkova^a, Franck Nguyen^a, Henry Proudhon^a, Thilo F. Morgeneuer^a, Wolfgang Ludwig^b

^a*MINES ParisTech, PSL-Research University, MAT-Centre des Matériaux, CNRS UMR7633, BP 87, F-91003 Evry Cedex, France*

^b*European Synchrotron Radiation Facility (ESRF), BP 220, F-38043 Grenoble Cedex, France*

Abstract

The evolution of voids has been used as an efficient indicator of the volume changes occurring during deformation for polymers which undergo high levels of plasticity. This has to be taken into account in determining the constitutive models for these polymers. Void growth during uniaxial stretching of a semi-crystalline polyamide 6 has been studied using 3D image analysis of tomography data. Tests on axi-symmetrical notched round bars have been stopped at : (i) the maximum net stress ; (ii) the end of the stress softening stage ; (iii) the onset of the final failure. Local synchrotron tomography has been performed so as to observe voids in a predetermined volume of interest around the minimum net section. The shape of the voids was found to be cylindrical. Mathematical morphology analysis was used to identify 3D voids, allowing the void diameter and height histograms to be obtained. An anisotropic shape factor parameter was defined as the ratio between the void diameter and the void height. This shape factor was found to evolve with the degree of deformation. The principal strain components of the voids were calculated and plotted, showing anisotropy and a heterogeneous distribution. The irreversible void growth noted as plastic dilation was also found to be heterogeneous in the deformed net section.

Keywords: A. Voids and inclusions, B. Finite strain, B. Polymeric material, B. Porous material, B. Finite elements

*. Corresponding Author. E-mail adress : lucien.laiarinandrasana@mines-paristech.fr, Tel : +33 1 60 76 30 64, Fax : +33 1 60 76 31 50

Download English Version:

<https://daneshyari.com/en/article/7174893>

Download Persian Version:

<https://daneshyari.com/article/7174893>

[Daneshyari.com](https://daneshyari.com)