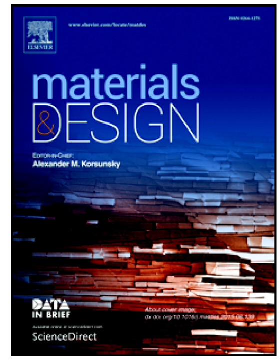
Accepted Manuscript



Two-scale study of the fracture of an aluminum foam by X-ray tomography and finite element modeling

Clémence Petit, Eric Maire, Sylvain Meille, Jérôme Adrien

PII: S0264-1275(17)30137-5
DOI: doi: 10.1016/j.matdes.2017.02.009
Reference: JMADE 2749

To appear in: *Materials & Design*

Received date: 9 December 2016
Revised date: 3 February 2017
Accepted date: 6 February 2017

Please cite this article as: Clémence Petit, Eric Maire, Sylvain Meille, Jérôme Adrien , Two-scale study of the fracture of an aluminum foam by X-ray tomography and finite element modeling. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), doi: 10.1016/j.matdes.2017.02.009

Two-scale study of the fracture of an aluminum foam by X-ray tomography and finite element modeling

Clémence Petit[1], Eric Maire[1*], Sylvain Meille[1], Jérôme Adrien[1]

[1] Université de Lyon, INSA de Lyon, MATEIS, CNRS UMR5510, F-69621 Villeurbanne, France

* Corresponding author: eric.maire@insa-lyon.fr, phone: +33 (0) 4 72 43 88 61

Abstract

An aluminum foam can be characterized by its architecture and by the solid phase' microstructure. Our aim is to link the foam's morphological and microstructural features with its mechanical properties thanks to X-ray tomography and finite element (FE). An approach combining X-ray tomography at different resolutions, image processing, and FE modeling was developed to take into account the influence of the intermetallics on the foam's fracture. First, the samples were scanned with "local" tomography, where the specimen is placed close to the X-ray source. These images allowed for observing intermetallics. Then an *in situ* tensile test was performed in the tomograph to follow the sample's deformation at low resolution. The images obtained from local tomography were processed to create one low-resolution image of the initial sample including details from high resolution. This was done by a series of thresholding and scaling of the high-resolution images. This image was used to generate a FE mesh. A FE input file was obtained thanks to Java programs associating the elements to the phases. At the local scale, the calculated stress distribution and the images of the struts were analysed. Our work confirms that the presence of inclusions can explain the fracture of struts.