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## Multi-scale tomographic analysis of polymeric foams: A detailed study of the cellular structure

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### Abstract

This manuscript presents a detailed characterization of the cellular structure of two types of polymeric foams by non-destructive multi-scale X-ray computed microtomography. This comparative study is conducted in two different polymeric materials –rigid polyurethane foams and cross-linked low density polyethylene foams-. Based on this technique and using 3D image analysis, conventional descriptors of the foams gaseous phase (cell size distribution, mean cell size and anisotropy ratio) are characterized at a standard voxel size of 5 microns. Complementarily, 0.4 microns voxel size synchrotron X-ray tomography data sets have been used to characterize, using a new image analysis approach, features of the solid phase of the foams (fraction of mass in the struts and thickness of the different entities of the solid architecture: struts and walls). The presented methodology, based on multi-scale tomographic analysis, allows obtaining a better understanding of the connection between foaming process and cellular structure and is important to gain knowledge on the structure-properties relationships for these materials.

*Keywords:* X-ray tomography; Imaging; Polyurethane; Polyethylene; Polymeric foams characterization

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