Elaboration and characterization of model porous polymer materials based on emulsions

G. Ceglia\textsuperscript{1}\textsuperscript{*}, D. Bernard\textsuperscript{2}, P. Viot\textsuperscript{3}, O. Mondain-Monval\textsuperscript{1} and V. Schmitt\textsuperscript{1}

\textsuperscript{1}Centre de Recherche Paul Pascal, 115 av. Schweitzer, 33600 Pessac, France
\textsuperscript{2}Institut de Chimie de la Matière Condensée de Bordeaux, 87 av. Schweitzer, 33600 Pessac, France
\textsuperscript{3}Laboratoire Matériaux Endommagement Fiabilité et Ingénierie des Procédés, Esplanade des Arts et Métiers, 33405 Talence, France
\textsuperscript{*}ceglia@crpp-bordeaux.cnrs.fr

Polymer foams are cellular materials commonly used for safety applications in many industrial sectors (aeronautic, passive safety gears...). In all applications, their light weight and their mechanical resistance are of great interest. To even improve their performances, the link between their structural parameters (cell sizes, density...) and their mechanical behaviour should be better understood and modelled. A way of producing such foams is to polymerize the continuous phase of highly concentrated emulsions [1]. The advantage of such an emulsion-based strategy is that it becomes possible to take advantage of the good control over emulsion parameters (drop size, dispersed phase volume fraction, continuous phase composition) [2,3] to elaborate model foams with cells and pores narrow size distributions.

The production of model foams makes it possible to determine independently the influence of each parameter on the compression modulus. The origin of unexpected dependence with the cell size and foam density is discussed: we propose that the foam walls are not homogeneous and propose a mean-field approach explaining the observed behaviours. To check the validity of the proposed hypothesis, micro-tomography experiments and transmission electronic microscopy are performed [3].