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NUMERICAL SIMULATION OF DEFORMATION PROCESSES IN AUXETIC FOAMS

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Most of engineering materials reveal positive value of Poisson's ratio that is if a material is stretching, then its cross-section is getting thinner. Similar situation occurs in polyether and metallic foams, which are objective of our study, [2]. The complex structure of the auxetic foam and concave foam cells cause the effect of negative Poisson's ratio.

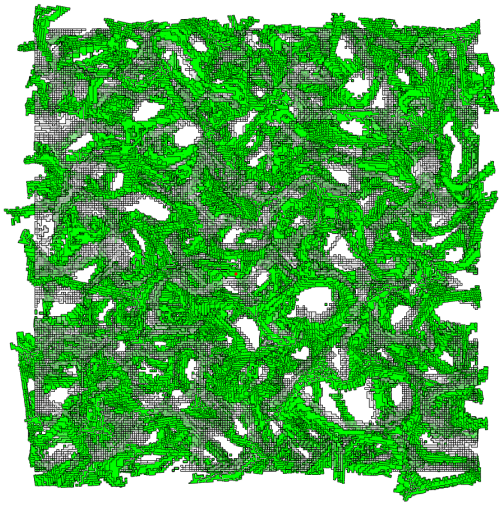

Figure 1: Deformed and undeformed cross section of auxetic foam sample in the middle of its height perpendicular to the tensile axis.

To simulate the deformation processes of such a material the finite element program ABAQUS was used. Finite element discretization was derived from real foam specimen

with use of computer tomography images using the procedures described in [1]. Dimension of a finite element corresponds to the dimension of a single voxel and is equal to $10\mu m$. In all numerical calculations the cube-shaped sample of the foam with dimensions of 200x200x200 voxels was considered. This assumption gives a representative volume element (RVE) of size 2mm. The material of the skeleton of the auxetic foam was assumed to be isotropic and linearly elastic. Fig. 1. presents, the deformed and undeformed cross section of auxetic foam sample with 96% porosity under tension load. Auxetic effect is clearly noticeable. The computational methods and procedures applied in the analysis of the tomography observations and numerical simulations of deformation processes are presented in detail.

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