Modeling of viscoelastic foams characteristics based on the multiscale finite-element analysis

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The purpose of the research was to develop a method for calculating viscoelastic foams characteristics at steady cyclical fluctuations. The method is based on the theory of asymptotic averaging of periodic structures. We stated local viscoelasticity problems on the periodicity cell. The method developed allows us to calculate a complete set of components of the tensor of complex foams moduli of elasticity in a given frequency range. An example of a numerical simulation of viscoelastic foams characteristics shows that viscoelastic foams properties characterized by loss-angle tangent of the complex moduli of elasticity can be multiextremal by nature, with the presence of several critical frequencies. Furthermore, we give an example of a three-dimensional finite-element calculation of fields of the microstrain concentration tensors in the walls of the foam. For FEM calculations we used specialized software developed at the Department of Computational Mathematics and Mathematical Physics of Bauman Moscow State Technical University.

Keywords: *viscoelastic characteristics, foam, multiscale modeling, method of asymptotic averaging, complex moduli of elasticity, loss-angle tangent, finite-element method, numerical simulation.*

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