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# Nonlinear dynamics of thermoelastic Sheremetiev-Pelekh nanobeams with topologically optimal microstructure

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*Abstract*: First, for specific loading conditions, heating conditions and fastening of the mechanical structure, one of the dimensions of which is much larger than the other two, a topological optimization of its microstructure by the criterion of maximum stiffness is carried out. Second, a mathematical model of the nano beam is constructed on the basis of the Sheremetev-Pelekh-Reddy kinematic hypothesis, taking into account the size-dependent behavior on the basis of the modified couple stress theory and geometric nonlinearity of von Karman. On the basis of the constructed mathematical model, the static and dynamic behavior of inhomogeneous (optimal) and homogeneous beams is studied. The paper compares the static and dynamic results for optimal and homogeneous beams, taking into account the size-dependent behavior, and without it, for different boundary conditions, temperature distribution and types of the employed load. It is shown that for a homogeneous beam and a beam with an optimal microstructure, the stress-strain state, the magnitude of the natural frequencies and the nature of the dynamic regimes differ significantly both for linear and nonlinear cases.

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