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Rozszerzone streszczenia
Abstracts

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Assessment of elastic stability of a nanorod accounting for scale effect

The paper presents the problem of elastic stability of the prismatic nanorod within the framework of nonlinear theory. The application of the classical theory of elasticity for the analysis of the problems on nanoscale is not adequate. Therefore, the nonlocal elasticity theory is taken into consideration. This theory assumes that the stress at a reference point is dependent not only on the strain state at this point, but there is also a function of strains at all points in the body.

The purpose of this work is to present a computational algorithm for obtaining the curves of deformed nanowires taking into account the scale effect. The list of various terms and their magnitudes, used to describe a nonlocal theory of elasticity will be presented and their physical interpretation will be discussed. The influence of these values on the shape of Euler elasticas will be presented. Numerical simulation of the considered problem, performed using software Wolfram Mathematica, will be presented. Critical loads were calculated and influence of scale effect of critical load will be examined. Afterwards, the differences between classical elasticity theory and nonlocal theory will be shown.

Interesting perspective in the development of nanostructures studies is account for surface energy of an element in connection with Molecular Dynamic calculations. The potential of this type of research reveal the structures like nanotube brush. Investigation of such nanostructures is possible with atomic force microscope or scanning microscopy.