First Pan American Congress on Computational Mechanics
PANACM 2015
April 27-29, 2015, Buenos Aires, Argentina

Free vibrations of Timoshenko micro beams using the modified couple stress theory

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ABSTRACT

A free vibration analysis of elastically restrained micro beams is performed based on Timoshenko beam theory. The analytical formulation is obtained applying the modified couple stress theory (MCST) [1]. The elastic boundary conditions are materialized by rotational and translational classical springs at both ends of the beam. Poisson's effect on free vibrations is analysed in conjunction with the material length scale. A study relating the classical elasticity model and the couple stress strain model is also presented. Numerical results for various boundary conditions are determined using the Ritz method, and they are compared wherever is possible with published results.

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