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PROCEEDINGS

Transient Analysis of Micro/Nano Plates by Moving Finite Element Method

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ABSTRACT

The paper deals with transient analysis of homogeneous as well as FGM (functionally graded material) thin micro/nano plates subjected to transversal dynamic loading. within the higher-grade continuum theory of elasticity. The microscopic structure of material is reflected in this higher-grade continuum theory via one material coefficient called the micro-length scale parameter. Furthermore the material can be composed of two micro-constituents what is included in the employed continuum model by functional gradation of the Young's modulus through the plate thickness with assuming power-law dependence of volume fractions of micro-constituents on the transversal coordinate. The high order derivatives of field variables are eliminated by decomposing the original governing partial differential equations (PDE) into the system of PDEs with lower order derivatives. For the numerical implementation, the weak formulation is proposed with novel Moving Finite Element approximation method of spatial variations of field variables. The semi-discretized equations of motion yield a system of ordinary differential equations which can be solved by standard time stepping techniques. Several numerical simulations are devoted to study the influence of micro-length scale parameter as well as the parameters of gradation of Young's modulus on coupled bending and in-plane deformation response modes.

KEYWORDS

FGM; transient; micro/nano plate; Moving Finite Element Method

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