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خلاصه مقاله:

Size-dependent longitudinal and torsional vibrations of nano-beams are examined by two-phase mixture integral elasticity. A new and efficient elastodynamic model is conceived by convexly combining the local phase with strain- and stress-driven purely nonlocal phases. The proposed stress-driven nonlocal integral mixture leads to well-posed structural problems for any value of the scale parameter. Effectiveness of stress-driven mixture is illustrated by analyzing axial and torsional free vibrations of cantilever and doubly clamped nano-beams. The local/nonlocal integral mixture is conveniently replaced with an equivalent differential law equipped with higher-order constitutive boundary conditions. Exact solutions of fundamental natural frequencies associated with strain- and stress-driven mixtures are evaluated and compared with counterpart results obtained by strain gradient elasticity theory. The provided new numerical benchmarks can be effectively employed for modelling and design of Nano-Electro-Mechanical-Systems (NEMS).

کلمات کلیدی:

Free vibrations, Nonlocal integral elasticity, Mixtures, Size effects, Hellinger-Reissner variational principle, Analytical modelling

لینک ثابت مقاله در پایگاه سیویلیکا:

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