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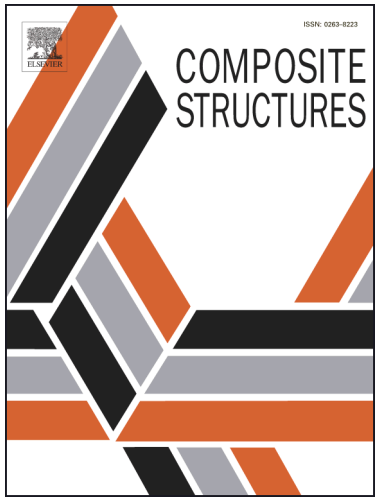


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# Dynamic characterisation of functionally graded imperfect Kirchhoff microplates

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**Abstract**

This paper aims at thorough investigation of the nonlinear forced vibration characteristics of functionally graded imperfect microplates. To this end, the modified couple stress (MCS) theory together with the Mori-Tanaka homogenisation technique is employed in order to take into account the size-dependent behaviour and the through-thickness variable material properties of the functionally graded imperfect microsystem, respectively. A geometric imperfection as a slight curvature is considered and all the out-of-plane and in-plane motions are retained in the nonlinear modelling and simulations. The nonlinear equations of motion are derived using the Lagrange equations; the large dimensional multi-degree-of-freedom truncated model is solved using a parameter-continuation method. Comprehensive investigations into the effect of material gradient parameter as well as the geometric imperfection on the dynamic characteristics of the functionally graded imperfect microplate are performed through extensive numerical simulations. Finally, the importance of incorporating

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