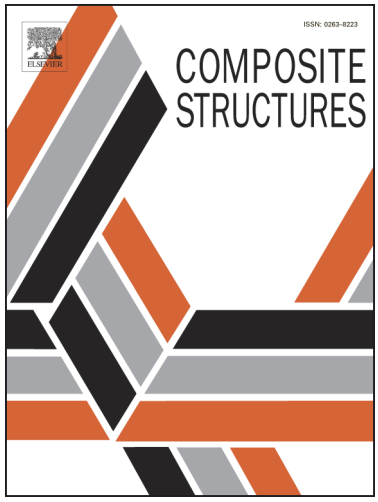

Differential evolution for free vibration optimization of functionally graded nano beams

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PII: S0263-8223(16)30209-4
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.03.052
Reference: COST 7350

To appear in: *Composite Structures*

Received Date: 21 December 2015
Accepted Date: 27 March 2016

Please cite this article as: Roque, C.M.C., Martins, P.A.L.S., Ferreira, A.J.M., Jorge, R.M.N., Differential evolution for free vibration optimization of functionally graded nano beams, *Composite Structures* (2016), doi: http://dx.doi.org/10.1016/j.compstruct.2016.03.052

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Abstract

A modified couple stress theory is used to study the influence of a scale parameter in the free vibration of a Timoshenko functionally graded beam. For energy harvesting of micro devices, it is require for the beam to resonate at low frequencies. In order to minimize the free vibration frequency of the beam, differential evolution optimization is used to solve the optimization problem. To describe the volume fraction variation along the beams thickness, a three parameter volume fraction law is chosen. Results show that for the selected volume fraction law, and considering linear analysis, the optimal material distribution across the beam thickness is independent of the scale parameter. Results are insensitive to tested boundary conditions.

To Professor Reddy, Professor JN Reddy contributed with an immense body of knowledge to the scientific community. His many contributions to the field of computational solid mechanics are well known and used by many. There is a common ground between his work and the work of others of equal scientific relevance - a respect for the fundamentals, often distilled in the form of introductory texts aimed at providing the best guidance for those at the beginning of their scientific journeys. For all that we are truly grateful as scientists; For his easy manner, his sense of humor and his friendship we are grateful - Thank you JN!

Keywords: Differential evolution, functionally graded material, Timoshenko nano beam, free vibration, optimization