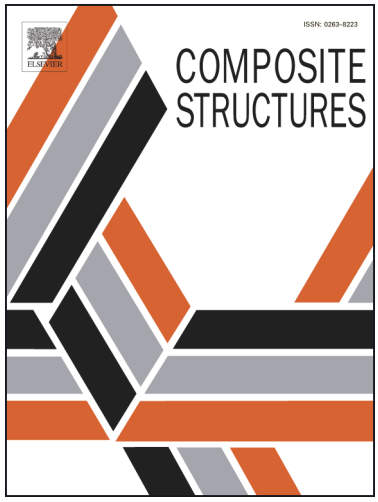

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MULTIOBJECTIVE OPTIMIZATION OF FUNCTIONALLY GRADED MATERIAL PLATES WITH THERMO-MECHANICAL LOADING

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ABSTRACT

This work addresses the design optimization of ceramic–metal composite plates with functionally graded material properties, varying through the thickness direction, subjected to thermo-mechanical loadings. Constrained multiobjective optimization is performed for mass minimization and material cost minimization as well as the minimization of stress failure criteria or maximization of natural frequency. The optimization problems are constrained by stress based failure criteria among other structural response constraints and manufacturing limitations. The design variables are the index of the power-law distribution in the metal-ceramic graded material and the thicknesses of the graded material and, eventually, also the metal and ceramic faces.

A finite element plate model based on a higher order shear deformation theory, accounting for the transverse shear and transverse normal deformations and considering the temperature dependency of the material properties, is applied for the optimal design of ceramic-metal functionally graded plates. The optimization problems are solved with two direct search derivative-free algorithms: GLODS (Global and Local Optimization using Direct Search) and DMS (Direct MultiSearch). A few multiobjective optimization problems are studied and the results are presented for benchmarking purposes.

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