

Characterisation of thermoelastic properties of heterogeneous materials using unified beam theories and the mechanics of structure genome

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It is well-known that composite materials present a hierarchic behaviour; that is, the different scales play a role in analysing structural problems. Multiscale models are considered a solution due to the enormous computational cost that direct numerical simulation would require. These modelling approaches comprise a bottom-up transfer of information to link the analyses from the constituent level to the macroscopic working structure [1]. Precisely, this work develops a methodology to solve the microstructural problem by providing accurate constitutive models and local responses, especially those concerning the thermoelastic effects, in a computationally efficient manner. For doing so, the Mechanics of Structure Genome (MSG) [2], previously coupled with refined CUF beam theories [3,4], has been employed to provide the homogenised thermoelastic properties (coefficients of thermal expansion and specific heat) of heterogeneous materials. The present approach also permits retrieving the local microscale stress state due to mechanical and thermal loading exerted over the macrostructure.

References

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