

Hybrid graded element model for transient heat conduction in functionally graded materials

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Abstract

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Abstract This paper presents a hybrid graded element model for the transient heat conduction problem in functionally graded materials (FGMs). First, a Laplace transform approach is used to handle the time variable. Then, a fundamental solution in Laplace space for FGMs is constructed. Next, a hybrid graded element is formulated based on the obtained fundamental solution and a frame field. As a result, the graded properties of FGMs are naturally reflected by using the fundamental solution to interpolate the intra-element field. Further, Stefest's algorithm is employed to convert the results in Laplace space back into the time--space domain. Finally, the performance of the proposed method is assessed by several benchmark examples. The results demonstrate well the efficiency and accuracy of the proposed method.

Keywords: Graded element model Functionally graded materials Hybrid FEM Transient heat conduction

Received 2010-10-13; published 2012-01-20

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Cite this article:

L.-L. Cao Q.-H. Qin N. Zhao. Hybrid graded element model for transient heat conduction in functionally graded materials[J] Acta Mechanica Sinica, 2012, V28(1): 128-139

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