

Thermal Stresses in Functionally Graded Metal-Ceramic Plates

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Abstract

Functionally graded composite materials are attracting interest among design engineers since structural component properties can be designed and customized into finished parts through processing. The controlled variable is the concentration of reinforcing particles at various points within the component. While locally isotropic, part properties can be made to vary in a controlled manner from point to point. This paper described modeling work aimed at the determination of temperature distributions and the associated thermal stresses in functionally graded materials. Material properties are determined from the values of those of the elementary constituents using the rule of mixtures and the Mori-Tanaka method. The Heat Transfer Module and Structural Mechanics Module in COMSOL Multiphysics® software are used to calculate the resulting temperature and stress fields for plates subjected to various boundary conditions.

Reference

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Figures used in the abstract

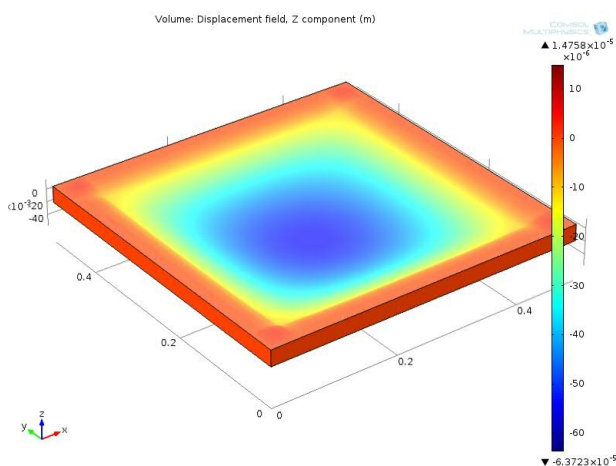


Figure 1: Computed vertical displacement. Plate clamped around all edges.

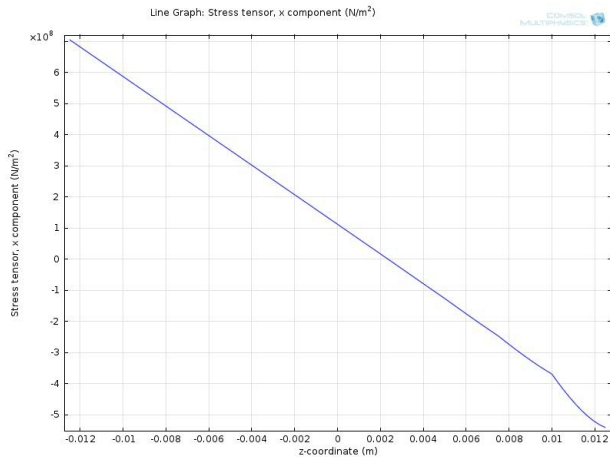


Figure 2: Longitudinal stress distribution along the plate thickness. Plate clamped around all edges.

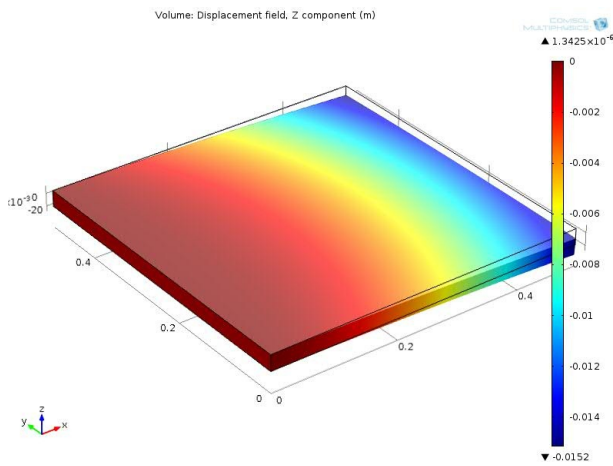


Figure 3: Computed vertical displacement. Plate clamped at one edge, all others free.

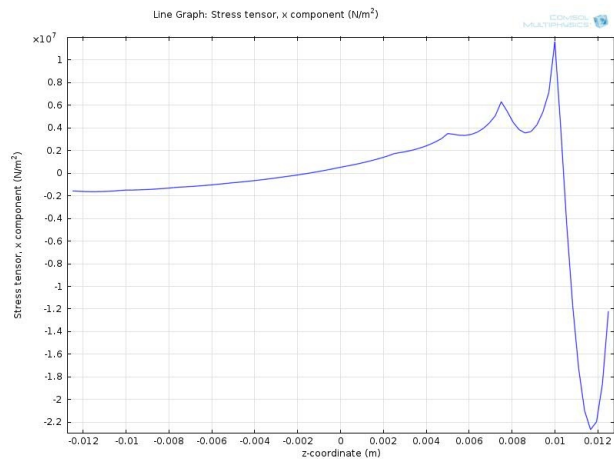


Figure 4: Longitudinal stress distribution along the plate thickness. Plate clamped at one edge, all others free.