Computational Models for High-Temperature Multilayered Composite Plates and Shells

Ahmed K. Noor and W. Scott Burton

Abstract

The focus of this review is on the hierarchy of composite models, predictor-corrector procedures, the effect of temperature-dependence of material properties on the response, and the sensitivity of the thermomechanical response to variations in material parameters. The literature reviewed is devoted to the following eight application areas: Heat transfer; thermal stresses; curing, processing and residual stresses; bifurcation buckling; vibrations of heated plates and shells; large deflection and postbuckling problems; and sandwich plates and shells. Extensive numerical results are presented showing the effects of variation in the lamination and geometric parameters of temperature-sensitive angle-ply composite plates on the accuracy of thermal buckling response, and the sensitivity derivatives predicted by nine different modeling approaches (based on two-dimensional theories). The standard of comparison is taken to be the exact three-dimensional thermoelasticity solutions. Some future directions for research on the modeling of high-temperature multilayered composites are outlined.

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Topics: Composite materials, Plates (structures), Shells, High temperature, Modeling, Buckling, Temperature, Heat transfer, Vibration, Bifurcation