

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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A BOUNDARY ELEMENT METHOD FOR TRANSIENT NONLINEAR RADIATIVE-CONDUCTIVE
COUPLED HEAT TRANSFER PROBLEMS

Abstract

A boundary-only formulation for transient radiative-conductive coupled heat transfer problems with nonlinear material properties of the thermal protection systems is presented. Heat radiation and conduction are coupled together by radiative heat source. Firstly, The Green's function for the Laplace equation is adopted in deriving basic conductive heat transfer integral equations. Secondly, domain integrals appearing in conduction boundary integral equation, radiative heat transfer equation and radiative heat source equation are transformed into boundary integrals using the radial integration method (RIM). Then, boundary integral equations are assembled together to form a set of nonlinear algebraic equations with quadruplicate of temperature. Finally, Newton-Raphson iteration method is applied to solve the nonlinear algebraic equations.