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Parametric Study for Optimal Design of an Air Plasma Sprayed Thermal Barrier Coating System with Respect to Thermal Stress

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Abstract

The use of thermal barrier coatings (TBCs) is expected to become more popular in various gas turbines because these coatings provide excellent thermal insulation and damage protection. However, unexpectedly early failure has often discouraged the full use of TBC, resulting in a shortening of the life span of gas turbines because these substrates are directly exposed to harsh operation conditions. The general mechanics of TBC and its complex inner phenomena, mainly related to failure, have been investigated to prolong the lifetime of TBC. However, our understanding is limited because TBC has various specifications and operating conditions, and complex interplays between many factors. The primary goal of this study is to construct an extensive finite element method (FEM) model to evaluate thermal stress of an air plasma sprayed TBC under its operating conditions by considering various inner phenomena, including thermal

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