Modeling Thermoelastoplasticity of Composite Materials

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ABSTRACT

The prediction of the thermoelastoplastic behaviors of composite materials and the corresponding constituents is essential and needs to be investigated from the theoretical and experimental aspects.

One of the promising theories to predict the behaviors of a composite on the micro-scale using finite element analysis is the multi-continuum theory (MCT) [1]. It is also used for evaluating the constituent-averaged elastic stress and strain from the composite-averaged counterparts.

In this research, the MCT is extended to handle the thermoelastoplastic behaviors of composites. A micromechanical model, which combines Eshelby and Mori-Tanaka models [2, 3], is used to determine the effective composite properties using the constituents ones. These properties are used to propose incremental non-linear governing equations. Also, the thermoelastoplastic decomposition of the composite strain is carried out to determine the constituents stresses and strains. The current work is validated by comparing its results with some others in the literature and good agreement is obtained.

REFERENCES

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