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THERMO-MECHANICAL COUPLING OF INHOMOGENEOUS MEDIA AND COMPLEX STRUCTURES

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Key Words: *Thermo-mechanical coupling, thermal protection, thermal stress analysis, inhomogeneous media, complex structure, damage and failure.*

PROPOSAL

Scope of the minisymposium: There are a variety of thermo-mechanical coupled problems in engineering, which have derived a number of research areas, such as thermal coupling in electronic packages, thermal failure of functionally graded materials, thermal mismatch of thermal barrier coatings, etc. Therefore, it is important to carry out the thermo-mechanical coupled analysis of inhomogeneous media and complex structures, reveal their failure mechanisms, and enhance the design level of materials and structures. For inhomogeneous media and complex structures, their damages and failures usually occur in the stage of transient thermal process. To this end, this mini-symposium will focus on the thermo-mechanical coupling behavior of inhomogeneous media and complex structures under the transient thermal loads, particularly in the case that the physical and mechanical parameters of materials change with temperature, because such problems are important and need to be addressed by developing the effective numerical method. Of course, for the thermo-mechanical coupled problems, some efficient numerical algorithms should also be developed.

Importance and applications: The importance of thermo-mechanical coupled problems is obvious, which can be explained by the following two examples. 1) To meet the double demands of thermal protection and mechanical load, the concept of FGMs was proposed. To ensure the application of functionally graded materials, one needs to investigate the failure of functionally graded materials under thermal shock loads, reveal its failure mechanism and guide the design of such materials. 2) Modern electronic packaging is toward the high-density and high-reliability direction. Heat dissipation problems caused by this are particularly prominent. While improving the thermal efficiency of packaging structures, the thermal stress of packaging structures needs to be analyzed to provide the basis for their design and preparation.

REFERENCES

[1] L.Z. Wu, Thermoelastic solutions for multilayered electronic assemblies, *Thin Solid Films*, 510(1-2), 203-212, 2006

[2] Richard B. Hetnarski and M. Reza Eslami, *Thermal Stresses – Advanced Theory and Applications,* Solid mechanics and its applications, Vol. 158, Springer, 2009.