SAND2006-4279C

To be submitted to the 2007 IMAC XXV
Orlando, FL, February 19-22, 2007

Validation of a Viscoelastic Model for Foam Encapsulated Component Response Over a Wide Temperature Range

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ABSTRACT

Accurate material models are fundamental to predictive structural finite element models. Because potting foams are routinely used to mitigate shock and vibration of encapsulated components in electro/mechanical systems, accurate material models of foams are needed. A linear-viscoelastic foam constitutive model has been developed to represent the foam's stiffness and damping throughout an application space defined by temperature, strain rate or frequency and strain level. Validation of this linear-viscoelastic model, which is integrated into the Salinas structural dynamics code, is being achieved by modeling and testing a series of structural geometries of increasing complexity that have been designed to ensure sensitivity to material parameters. Both experimental and analytical uncertainties are being quantified to ensure the fair assessment of model validity. Quantitative model validation metrics are being developed to provide a means of comparison for analytical model predictions to observations made in the experiments. This paper is one of several recent papers documenting the validation process for simple to complex structures with foam encapsulated components. This paper specifically focuses on model validation over a wide temperature range and using a simple dumbbell structure for modal testing and simulation. Material variations of density, modulus, and damping have been included. A double blind validation process is described that brings together test data with model predictions.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94-AL85000.