Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Viscoelastic Behavior of Polyhedral Oligomeric Silsequioxane (POSS)-Filled Epoxy Matrices QINGXIU LI, STEPHEN HUTCHESON, GREGORY MCKENNA, Texas Tech University, KADINE MOHOMED, TA Instruments-Waters LLC, SINDEE SIMON, Texas Tech University — Large residual stress in fiber-filled thermosetting resin composites is a major technological problem encountered during the development and applications of these materials. Strategies to reduce the residual stress of the composites include lowering the thermal stress coefficient by lowering the product of coefficient of thermal expansion and shear modulus (αG) and/or lowering the thermal pressure coefficient by lowering the product of coefficient of thermal expansion and bulk modulus (αK). Nanoparticles are unique fillers for resins used in composites and generally result in improved moduli and reduced linear thermal expansion coefficient (CTE); however, the effect on the thermal residual stresses has not been addressed. This paper develops epoxy/polyhedral oligomeric silsequioxane (POSS) nanocomposites with mitigated residual stress. The effect of functionalized POSS loading on the viscoelastic properties, linear coefficient of thermal expansion, and glass transition temperature of epoxy/POSS nanocomposites is investigated. The outcome of the current study provides fundamental knowledge to the design criteria for nanoparticle-filled polymer matrix composites with mitigated residual stress and high shear properties.

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Date submitted: 13 Nov 2007 Electronic form version 1.4