Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Quantifying Uncertainty in Materials Properties from Microstructure Variability[1] CORBETT BATTAILE, LUKE BREWER, BRAD BOYCE, JOHN EMERY, Sandia National Laboratories — Most materials are inherently inhomogeneous. This means that their internal structure varies from point to point on the microscale; from region to region on the macroscale; from part to part; and throughout time as they age. Because a material's microstructure often controls its properties, the variability in structure leads to uncertainty about the material's properties and performance. We will discuss the concept of a statistics-based treatment of the process-structure-properties-performance relationships in engineering materials, and describe both experiments and computational simulations designed to quantify the statistics underlying structure-properties relationships in poly-silicon MEMS devices, stainless steel welds, and alpha-brass with engineered defects.

[1]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-AC04-94AL85000.

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Date submitted: 21 Dec 2009 Electronic form version 1.4