

MATERIALWISSENSCHAFTLICHES KOLLOQUIUM

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**Bulk Nanostructured Materials for
Advanced Aerospace Structural Applications**

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Abstract:

Bulk nanostructured materials offer tremendous opportunity for re-inventing materials, but also pose many challenges both in terms of characterization, design, processing, and scaling. This presentation will focus on recent work developing nano-engineered advanced composites for aerospace applications. Such hybrid advanced composites employ aligned carbon nanotubes (CNTs) to enhance laminate-level multifunctional properties of existing aerospace-grade advanced composites. Intrinsic and scale-dependent characteristics of the CNTs are used to engineer laminate-level property improvements: interlaminar shear strength, interlaminar toughness, tension-bearing strength, thermal and electrical conductivity results will be discussed and the underlying mechanisms elucidated. Fundamental studies on polymer-CNT interactions led to the development of a combined top-down and bottom-up fabrication methodology that addresses several of the key issues (agglomeration, viscosity, CNT wetting, scale, alignment) that have frustrated the use of CNTs in nanocomposites and nano-engineered composites. Current research to answer key outstanding “questions of the day” related to CNT contributions to bulk composite properties will be overviewed, including a novel experimental platform to investigate nanoscale interactions in a well-controlled manner. New research results and directions stemming from ongoing work, particularly new applications in related disciplines, will be discussed.