Fundamentals, Properties, and Applications of Polymer Nanocomposites

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SEMINAR ABSTRACT

The introduction of inorganic nanomaterials as additives into polymers has resulted in polymer nanocomposites exhibiting a multiplicity of high-performance characteristics beyond what traditional polymeric composites possess. These "multifunctional" features attributable to polymer nanocomposites consist of improved properties, such as thermal, flammability, ablation, electrical, moisture, chemical, permeability, and others.

Through control/alteration of the nanoadditives at the nanoscale level, one is able to maximize property enhancement of selected polymer systems to meet or exceed the requirements of current commercial, and aerospace applications.

This seminar includes the following topics:

- An overview of different nanomaterials,
- Processing techniques,
- Characterization methods, and
- Selective examples to examine the behavior of polymer nanocomposites for applications, such as
    - Ablative polymer nanocomposite technologies,
    - Flame-retardant and conductive polymers for additive manufacturing,
    - High-temperature films/coatings and carbon fiber-reinforced composites.

ABOUT THE SPEAKER

Dr. Koo has over 40 years of industrial and academic experience in program and engineering management. Currently, he is Senior Research Scientist/Research Professor/Director of Polymer Nanocomposites Technology Lab in the Department of Mechanical Engineering at The University of Texas at Austin, Austin, TX. Dr. Koo is the founder of KAI, LLC and currently serves as Vice President and CTO. He is a SAMPE Fellow and Chairman of the SAMPE Nanotechnology Committee. Dr. Koo is an Associate Fellow of AIAA and Past-Chair of the AIAA Materials Technical Committee. He specializes in polymer nanocomposites: processing, characterization, and applications, such as ablatives for thermal protection systems for reentry vehicles, solid rocket motor propulsion systems, and missile launching systems; flame-retardant polymers; additive manufacturing polymers, fire resistant fabrics & textiles; thermally conductive polymer matrix composites; sensor to measure in-situ ablation recession and thermal properties; sensors to measure char strength; thermophysical properties characterization; ablation material response modeling; polymer degradation modeling; and insensitive munitions technology of solid rocket motors.

Dr. Koo's publications include two books, *Polymer Nanocomposites: Processing, Characterization, and Applications*, McGraw-Hill, New York (2006), and *Fundamentals, Properties, and Applications of Polymer Nanocomposites*, Cambridge University Press, Cambridge, UK (2016), and over 550 papers/presentations in materials, thermal and optical science disciplines. Two new books are forthcoming, *Polymer Nanocomposites: Processing, Characterization, and Applications*, 2nd Edition, under McGraw-Hill, New York contract, and *Ablation Science and Technology; Processing, Characterization, and Modeling*, under Cambridge University Press, Cambridge, UK contract.