Polymer Nanocomposites: Processing, Characterization, and Applications

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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 mechanical, thermal, flammability, ablation, electrical, chemical, permeability, optical, and others. Through control/alteration of the additive at the nanoscale level, one is able to maximize property enhancement of selected polymer systems to meet or exceed the requirements of current commercial, military, and aerospace applications. This seminar includes: an introduction to nanotechnology, an overview of different nanomaterials, processing and characterization techniques, and selective examples to examine the behavior of polymer nanocomposites for additive manufacturing, re-entry vehicles, and rocket propulsion engines.

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, and Director of Polymer Nanocomposites Technology Lab in the Department of Mechanical Engineering at The University of Texas at Austin, Austin, TX. He is the founder of KAI and currently served 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 is the Editor-in-Chief, *Flame Retardancy and Thermal Stability of Materials (*http://www.degruyter.com/view/j/flret). He specializes in polymer nanocomposites, such as ablatives for thermal protection system and rocket propulsion system, flame-retardant polymers and ultra-performance polymers for additive manufacturing, fire resistant nonwoven and woven fabrics, thermally conductive polymer matrix composites, sensors to measure in situ ablation recession and thermal properties, sensors to measure char strength, modeling of polymer degradation, material response ablation modeling, and hypersonic flowfield modeling. Dr. Koo's publications include three textbooks: *Polymer Nanocomposites: Processing, Characterization, and Applications,* 1st ed., McGraw-Hill, New York (2006); *Fundamentals, Properties, and Applications of Polymer Nanocomposites*, Cambridge University Press, Cambridge, UK (2016); *Polymer Nanocomposites: Processing, Characterization, and Applications,* 2nd ed., McGraw-Hill, New York (2019), 15 book chapters, and over 550 papers/presentations in materials, thermal and optical science disciplines. *Ablation Science and Technology: Processing, Characterization, and Modeling*, Cambridge University Press, Cambridge, UK is forthcoming in June 2020.