



University at Buffalo

Department of Mechanical
and Aerospace Engineering

School of Engineering and Applied Sciences

Research and Development of Polymers for Additive Manufacturing

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Abstract

A revolution is occurring in the manner that parts are made. It started with techniques and machines providing a means to rapidly build prototypes of hardware in various polymers for marketing, etc. However, new techniques have quickly progressed in the manufacturing of parts used in aerospace flight vehicles, such as rocket engines. These are no longer toys or desktop displays that are being made. Almost every week, it is reported that additional parts critical to flight are now being manufactured by techniques labeled 3D printing or additive manufacturing (AM). Furthermore, the materials used in these techniques are quickly expanding. The geometries are becoming more complex and the addition of fibers and powders into the matrix are being attempted. In this seminar, an overview of additive manufacturing techniques, such as selective laser sintering (SLS), fused deposition modeling (FDM), and HP Jet Fusion 3D printer (JF3D) will be presented. The similarities and differences of these three AM techniques are compared. R&D of different polymers that can be used by these three AM techniques are undergoing study at UT Austin. Material properties characterization of these AM polymers will be discussed.

Bio Sketch



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 Dept. 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. His research group specializes in “*Polymer Nanocomposites Technology Designed for Extreme Environments*” for four major research areas: Ablation Research, Flame Retardant Polymers, Conductive Polymers, and Additive Manufacturing Polymers. 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 500 papers/presentations in materials, thermal and optical science disciplines.

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