seminar

"Accelerating the Development of Polymer Composites: Modeling & Scalable Manufacturing"

Amir Asadi, PhD

G. W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology

abstract

This seminar intends to provide a roadmap to implement predictive modeling and scalable manufacturing to minimize the number of iterations and reduce the cost and time in development of polymer composites with engineered performance. The advantage of predictive modeling in design of composites with desired performance is explained using a mathematical model to predict the evolution of damage in multiple plies of a multidirectional polymer composite and its effect on mechanical properties and creep behavior of the laminate. This model shows how predictive modeling can result in lighter structures even in advanced composite structures. Then, a scalable manufacturing technique is introduced to produce a new class of lightweight hybrid (nano/ micro) composites for automotive applications by incorporating cellulose nanomaterials in a large-scale sheet molding compound (SMC) manufacturing line. SMC, which are materials consist of short glass fiber impregnated between two layers of thermosetting resin are the precursor composites for automotive structural applications. The new lightweight SMC composites are 8% lighter with no penalty in mechanical properties. The processing parameters and characterization are similar to those used within the industrial sized production lines.

biosketch

Dr. Amir Asadi is currently a postdoctoral researcher at the Woodruff School of Mechanical Engineering at Georgia Institute of Technology. He obtained his PhD in Mechanical and Manufacturing Engineering from University of Manitoba, Canada and his M.Sc. and B.Sc. degrees in Mechanical engineering from Iran University of Science and Technology, Tehran, Iran. His research experience spans from synthesis and utilization of nanocomposites to manufacturing and modeling of conventional and hybrid (micro/nano) composites. In his PhD research, he developed a mathematical model to predict the properties and creep behavior of composite laminates. In his postdoc research, he focused on scalable manufacturing of lightweight hybrid composites. Dr. Asadi has been the recipient of the University of Manitoba Graduate Fellowship, International Graduate Scholarships of University and the best paper award in the Conference of Metallurgists, COM 2010, Vancouver. He has recently published a book chapter on process-structure-property relationship in polymer nanocomposites" in "Experimental characterization, predictive mechanical and thermal modeling of nanostructures and their polymer composite" by Elsevier.

March 20 at 1:30 p.m. in Santa Catalina 155

Seminar is free and available via Abode Connect https://connect.asu.edu/thepolytechnicschool/

Ira A. Fulton Schools of Engineering
Arizona State University