



MULTI-SCALE MODELING AND SIMULATION OF COMPOSITE MANUFACTURING PROCESSES

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Abstract: This talk will focus on how the science base of materials processing, which integrates material parameters with transport phenomena at various scales during manufacturing, can be used to create multi-physics models and implemented in simulations to describe the effect of material, geometric and process parameters on the final quality of the part. Use of process models and simulations to improve composite manufacturing processes to fabricate light weight composites structures for transportation, wind and energy storage applications will be presented. The simulations can be seamlessly interfaced with optimization, functional design and process control tools to improve the yield of the process despite the variability in the incoming materials and process parameters. Automation can be introduced with equipment designs that rely on sensors and simulations interfaced with actuators to address variability and disturbances in the process. Examples where this has been demonstrated on a laboratory scale will be presented for Liquid Molding processes such as Resin Transfer Molding, Vacuum Assisted Resin Transfer Molding and Compression Resin Transfer Molding.