

Public Abstract

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Ph.D.

**Exploratory Development of VARIM Process for
Manufacturing High Temperature Polymer Matrix Composites**

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This research focuses on an exploratory development of vacuum assisted resin infusion molding (VARIM) process for manufacturing high temperature polymer composite materials. High temperature matrix composites are needed for high speed civil transport and advanced tactical fighters. The present study involves development of a comprehensive process virtual model and a physical model to relate the process conditions to the evolved properties and defects in the molded composites. The virtual model simulates the process to help in mold design and process optimization. The physical model investigates the feasibility of VARIM for fabricating high temperature polymer composites and the behavior of the process with the changes in its parameters. Characterization of properties, defects, and internal structure of produced composites is the major thrust in this study.

Based on the developed virtual model and with the appropriate mold design, sound panels were successfully molded. Thus, the VARIM process was found to be feasible for fabrication of high temperature polymer composites. The virtual/experimental investigation helps to produce composite materials free of defects with the highest

possible mechanical properties suitable for high temperature applications. The findings of this research will help in developing a science based technology for the VARIM process for understanding of the process behavior and the effects of various process parameters on the properties and integrity of the produced composites.