Polymer Matrix Composites Fabrication and Testing

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Abstract

This project involves two separate processes for fabricating carbon fiber composite parts using Hexcel's RTM6 resin system and Kaneka's IR-6070 toughened resin system to impregnate carbon fiber tow and weave. These two resins were chosen to model microcracking in parts using RTM6 compared to parts using IR-6070. Plies of the composites were made by painting resin onto 8 harness satin weave or impregnating IM7 12k tow in a prepregging machine. Plies were consolidated using an out-of-autoclave oven or a heat press. Fabrication of the composite parts were conducted with the end goal of sending the composites to be tested and modeled for microcracking. The data will be used for computer modeling in the future.

Acknowledgements

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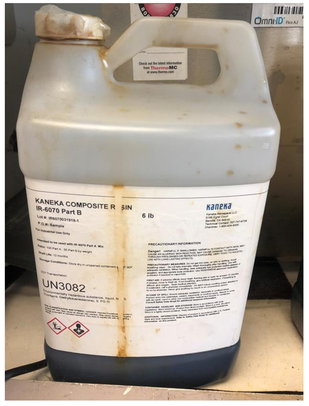


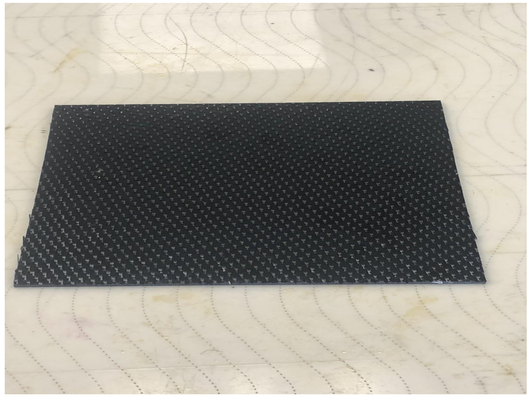
Fabrication of Composite Parts Using Carbon Fiber Weave

Objective

Create carbon fiber composite parts for mechanical testing using Hexcel's RTM6 resin system and Kaneka's IR-6070 toughened resin system to impregnate and consolidate plies of 8 harness satin weave carbon fiber.

Procedure

Parts are fabricated by first painting resin onto fabric plies, then consolidating the plies in an out-of-autoclave oven or heat press.



Results

After solving issues regarding resin bleed during curing cycles and resin content in the final composite, the parts made were well consolidated, but hard to reproduce because of the manual impregnation of the weave.

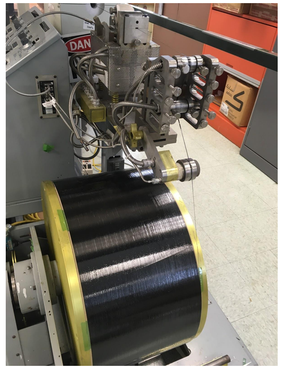
Fabrication of Composite Parts Using Unidirectional Carbon Fiber Tow

Objective

Create carbon fiber composite parts for mechanical testing using a prepregging machine to impregnate Hexcel's IM7 12K unidirectional carbon fiber tow with Hexcel's RTM6 resin system or Kaneka's IR-6070 toughened resin system.

Procedure

Parts are fabricated by first impregnating IM7 unidirectional tow in a prepregging machine and winding the tow around a flat drum to be cut into individual plies. The plies are then consolidated in an out-of-autoclave oven or heat press.



Results

Prepregging resulted in a range of resin content due to the nature of the hot melt prepreg process. Processing trials for consolidation demonstrated that tooling, time, temperature and pressure variables had a significant impact on panel quality.