

Thermal and Mechanical Characterization of C/C Composite Produced via Highly Processable BODA- Derived Precursor Resin System

ASE Senior Seminar Proposal

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9/11/2024

Proposed Problem Statement

Problem Statement:

This project seeks to characterize the Carbon/Carbon (C/C) Composites derived from Bis-ortho-diynylarene precursor resin system. We seek to highlight the high processability of this precursor resin system and shortened manufacturing times and confirm the quality of student fabricated C/C composite materials via mechanical and thermal characterization. We will characterize Young's modulus, shear modulus, Poisson ratio, coefficient of thermal expansion, and other mechanical and thermal properties to compare to industry standard C/C composites.

Proposed Objectives

1. Produce Carbon/Carbon composite coupons using the BODA-derived precursor resin system.
2. Preform testing in the following areas:
 - Compression Molding
 - Dynamic Mechanical Analysis
 - Tensile Testing
 - Thermal Cycling
 - Scanning Electrons Microscope
3. Compare mechanical and thermal characteristics of the Carbon/Carbon composite produced to industry standard composites.
4. Creation of website to present the data collected and gathered conclusions

Advisors

Han-Gyu Kim, Ph. D. - Aerospace Engineering Department

Dr. Kim's expertise in material behavior and experience with material testing and characterization will be vital in the thermomechanical testing phase of our project.

Ernesto Borrego, Ph. D. - HAND Technologies LLC

Dr. Borrego, having done extensive research on BODA derived precursors resins and C/C composites, with several scholarly articles on the subject, will provide invaluable insight during the creation of the C/C composites coupons. Additionally, as CEO of HAND Technologies, he will sponsor the materials and resources; thus, making this project feasible.

Project Timeline

Present plan including

- *Project deliverables and due dates in format -- mm/dd*
 - Down Selection of Resin Formulation - **09/20**
 - Test Coupon Manufacturing Completed – **10/10**
 - Rheology completed - **09/30**
 - Initial SEM Scans – **09/30**
 - Thermomechanical Testing begins – **10/15**
 - Thermomechanical Testing Ends – **11/15**
 - Technical Write-up Reviews with Advisors – **11/15**

Your planned actions to support / complete the stated deliverables with target dates

- *This can be presented as a list or preferably a Gantt Chart.*
- *You will monitor your progress against this plan.*

Questions?