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

ASE Senior Seminar Update

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Problem Statement

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This project seeks to characterize the Carbon/Carbon (C/C) Composites derived from Bis-ortho-diynylarene (BODA) 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.

Objectives

- **Identify a fabrication method for BODA composite test coupons**
  - **Equipment – (100%)**
  - **Rheology – (0%)**
  - **Mold – (40%)**
  - **Manufacturing Method – (50%)**
  - **Coupon Manufacturing – (0%)**
- **Characterize mechanical and material properties – (0%)**
  - **Scanning Electron Microscopy (SEM)**
  - **Coefficient of thermal expansion**
  - **Young's Modulus**
  - **Shear Modulus**
  - **Poisson's ratio**
- **Compare gathered data with previously published data on phenolic-based C/C to identify benefits/drawbacks of using BODA resins for C/C -(0%) – (0%)**

Past Month's Accomplishments

- Access to Advanced Composites Institute (ACI) compression molder
- Procured suitable tube furnace
- Mr. Griffin created a design of our molds with assistance from Mr. Brandon Warner. Our molds shall create coupons with dimensions of 260mm by 26mm by 1 mm utilizing Aluminum T6061. **As of this moment (Oct. 2), we have manufactured the female die**.
- We have created a website, seniorseminar2025.github.io, to document our methodologies, cited documents, and other documents.
- Tentative creation of first coupon on October 14.

Plan for Next Month

- For October, we plan to finish the creation of our test coupons. We have planned Monday, October 14th, as our tentative date for coupon manufacturing. Once we have our finished polymer matrix composite, then we will carbonize to 1000 °C under inert gas in a tube furnace in Swalm. After carbonization, we will be able to run tensile tests with Dr. Kim. Once thermo-mechanical testing has finished, we will discuss with our advisors the necessity of expanding the scope of our project (characterizing the polymer matrix composite as well).

Questions?