



TRICE RESEARCH GROUP FOR HYPERSONIC MATERIALS

HOT STRUCTURE

- ADDITIVE MANUFACTURING OF C/C COMPOSITES
- DIRECT INK WRITE OF C_x/SiC CERAMIC MATRIX COMPOSITES
- ENERGY ABSORBING CERAMICS FOR ROTATING DETONATION ENGINE CERAM
- DIGITAL LIGHT PROJECTION AM OF CERAMICS
- JOINING OF DISSIMILAR CERAMICS
- MORPHING HOT STRUCTURE

WINDOWS

- RF (POROUS Si₃N₄ VIA SLIP CASTING)
- RF DIRECT INK WRITE OF Si₃N₄
- IR (PLATELET AL₂O₃ AND Y₂O₃/MGO)

THERMAL PROTECTION SYSTEMS

- HIGH EMISSIVITY AND OXIDATION RESISTANT COATINGS FOR C/C COMPOSITES
- SILICIDE COATINGS FOR Nb ALLOYS
- CHARACTERIZATION OF SPACE-SHUTTLE TILES PRODUCED VIA AUTOMATION

*Daylon Illustrations
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Expertise:

Materials

ZrB₂, Si₃N₄, Al₂O₃, B₄C, SiC, ZrO₂, CMCs, etc

Ceramic Processing

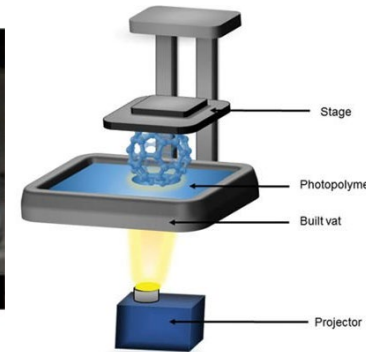
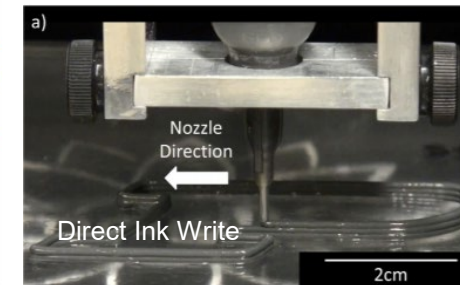
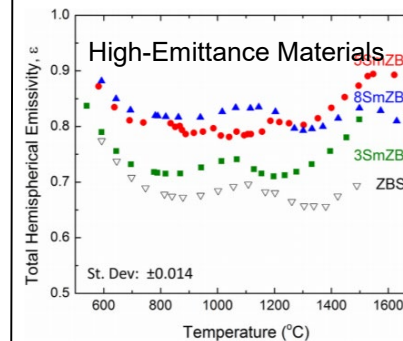
sintering, rheology, additive manufacturing, extrusion manufacturing, digital light projection, co-extrusion, plasma spray, suspension plasma spray

Testing

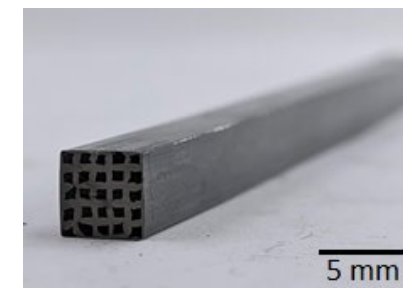
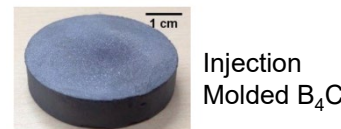
35 years mechanical testing at elevated temps, thermal analysis, failure/stress analysis, ablation testing, emittance testing

Current Research:

- AFOSR: Design of Energy Absorbing and Tough Ceramics for Rotation Detonation Engines (Co-managed with Prof. Carlos Martinez)
- NSTXL/NAVSEA: Incorporating BNNTs into Silicon Nitride (Co-managed with Prof. Jeffrey Youngblood)
- Canopy Aerospace: AFWERX Phase II STTR Proposal – Autonomous Robotic Coating for TPS (ARCT)
- Canopy Aerospace: MDA Phase I STTR Proposal – Coatings for C/C
- AFRL Midwest Hub: Morphing Surfaces - PI Andres Arrieta
- Prof. Andres Arrieta PI
- DOE Bioenergy Technologies Office (BETO): Higher Energy Content Jet Blending Components Derived from Ethanol, PI Gozdem Kilaz
- Industrial: Investigation of APS EBCs (Co-managed with Prof. Mike Titus)
- OSD Manufacturing Science & Technology Program via NSWC Crane and NSTXL: Hypersonic Advanced Manufacturing Testing Capability (HAMTC), Prof. Michael Sangid, Executive Director
- My colleagues and I also have students supported by DRAPER Graduate Student Fellowship, and the Purdue Military Research Institute.
- Prof. Trice has developed and taught a “Ceramics for Hypersonic Applications”



Digital Light Processing of Dark Powders



Extrusion Forming of Complex Structures