

## Attachment 1 – DAGSI Research Topic Template

**NOTE: Under the Cooperative Agreement, Technical Directorates have three options for topics. First, a topic can strictly be considered in the pool for the state allocation of funding. DASI will work across the TDs for this allocation. Second, the TD can be prepared to be a funding partner with the State of Ohio. This would include: providing additional funds to support additional recipients of a topic, or expand the proposers team to include additional members on a topic. Third, the TD may elect to fully fund a topic not selected for State of Ohio funding or to pursue University teams outside the State of Ohio. Contact [Michael.hitchcock.3@us.af.mil](mailto:Michael.hitchcock.3@us.af.mil) for questions**

1. **Research Title:** Advanced Processing of Ceramic and Ceramic Matrix Composite Structures
2. **Individual Sponsor:**  
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3. **Academic Area/Field and Education Level:** Materials Science Engineering (MS or PhD level)
4. **Objectives:** 1) Develop novel processing control and/or techniques for ceramics and ceramic matrix composites (CMCs) for higher temperature and environmental stability, and increased mechanical performance. 2) Investigate effects of these processes and processing parameters on the material (micro)structure and thermal and mechanical behavior.
5. **Description:** New and/or advanced materials and processing techniques are required to enable the development of next generation Air Force propulsion and hypersonic components. Our focus is on fundamental structure-property-processing relationships for ceramics and ceramic matrix composites across all length scales. Areas of interest include: novel processing and characterization of ceramic matrix composite (CMC) materials, preceramic polymer processing (AM, fiber design, etc.), nanostructure control, and additive manufacturing. CMCs have been a large area of focus in our Ceramic Materials and Processing Team due to their enhanced toughness and durability. While they have been employed successfully in commercial applications, composite design and constituent engineering and improvements are ongoing. Preceramic polymers, organic moieties that convert to inorganic materials upon thermal treatment, are a key aspect in forming CMC matrices through infiltration and pyrolysis cycles. Their polymeric properties also afford rheology control and allow for more complex processing techniques to be used. As such, characterization and design of existing or new polymer systems is key. New CMC processing methods, improved constituents (fibers, matrix, coatings, etc.), and novel process optimization and modeling all offer potential benefits in the industry. Additive manufacturing methods such as direct ink writing, fused deposition modeling, and stereolithography are all tools of interest for creating more complex shaped ceramic and ceramic composites with designed microstructures. Furthermore, the control of micro and nanostructure within additive manufacturing offers hierarchical structure control for enhanced mechanical behavior.
6. **Research Classification/Restrictions:** Unclassified/No restrictions
7. **Eligible Research Institutions:** All

**NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #**