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 and 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 components. Our focus is on fundamental structure-property-processing relationships for ceramics and ceramic matrix composites (CMCs) across all constituents and length scales. Materials of interest include ceramics and CMCs with high- and ultra-high temperature ceramic (UHTC) components that can withstand the harsh environments encountered in AF components. These materials include, but are not limited to: oxide and non-oxide based CMCs, structural ceramics with RF transparency, and fiber-reinforced UHTCs. Advancements in regards to fundamental understanding of the inherent material properties, novel processing routes, and relevant environmental characterization are desired. Additive manufacturing (AM) methods such as direct ink writing, fused deposition modeling, and stereolithography are all tools of interest for creating more complex-shaped ceramic and composites with tailorable microstructures. Additionally, exploration of process modeling and/or in-situ monitoring is beneficial in providing enhanced understanding of traditional and AM-based ceramic and CMC processing.

6. **Research Classification/Restrictions:** Unclassified/no restrictions

7. **Eligible Research Institutions:** All

8. **PA Approval #:** Distribution A. Cleared for public release; distribution unlimited (AFRL-2023-4069)