


1. **Research Title:** Data-Rich Experimentation for the Determination of Microstructure Kinetics.
2. **Individual Sponsor:** List the AFRL research topic sponsor's contact information

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3. **Academic Area/Field and Education Level**

Materials Science and Engineering, Physical Metallurgy and Microstructure Characterization
(Masters or Ph.D. level)

4. **Objectives:** The objective of this research is to develop and integrate tools to enable discovery of new material classes for aerospace structural materials.
5. **Description:** This project will include fabrication of novel materials and characterization of microstructure, including defect structures and non-traditional microstructural features. Data-rich experimentation utilizing gradients in alloy and/or processing conditions should be considered in order to efficiently gather data for a wide range of microstructural conditions. High-throughput materials characterization (optical microscopy) and limited mechanical property evaluation (hardness mapping) will be performed. 3D microscopy, compressed sensing, machine learning, and neural network modeling will be used to develop an efficient and comprehensive strategy to interrogate local microstructures of specific samples in more detail using various analytical electron microscopy tools (SEM, TEM, EBSD, EDS, EPMA). Particular emphasis will be placed on associating local thermo-mechanical conditions to the kinetics and thermodynamics to explain the resultant microstructure. Experimental data will be utilized to verify and validate diffusion and models of transformations kinetics for the new alloy class.
6. **Research Classification/Restrictions:** There are no anticipated restrictions for this research.
7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided

 **DAGSI** (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati) NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #88ABW-2014-2813