

Attachment 1 – Research Topic Template

RX14-14

1. **Research Title** Data-Rich Experimentation for the Determination of Microstructure Kinetics.
2. **Individual Sponsor:**
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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 and characterization of microstructure, including evaluation of defect structure 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. Advanced characterization and analytical approaches (such as 3D microscopy, compressed sensing, machine learning, and neural network modeling) should be considered to efficiently and comprehensively interrogate local microstructure. Conventional microstructural information will be determined and analyzed using various analytical tools, including optical and electron microscopy (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 kinetics models 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)
PA Approval #: 88ABW-2013-3417

AFIT (only)

USAFA (only)

If you are submitting a topic for the USAFA, please indicate if you are also interested in sponsoring a USAF Cadet in summer of 2013 (Avg Cost for USAF Cadet for 33 days was \$5000)

Yes No