

1. Research Title: “Enhanced Superconductors and Growth Diagnostics for Lightweight Power Systems.”

2. Individual Sponsor:

Dr. Paul N. Barnes
AFRL/PRPG, Bldg 450
1950 Fifth St
WPAFB, OH 45433
paul.barnes@wpafb.af.mil

3. Academic Area/Field and Education Level: Physics, Materials Science, Engineering (MS or Ph.D. level)

4. Objectives: Develop the HTS coated conductor materials or improve the deposition processes. Improve the diagnostics (such as optical, etc.) to better understand the growth mechanisms of the YBCO conductor for process control for economic manufacturing of High Temperature Superconducting (HTS) wires; or develop high current in-field capability in combination with appropriate stabilization layers and ac loss considerations that will maintain effective engineering current densities in the HTS coated conductors for generator, motor, magnet, and energy storage applications.

5. Description: (1) Identify approaches and determine the best method to incorporate effective pinning centers in HTS films, appropriate low ac loss structure, and/or develop effective stabilization layers for the HTS coated conductor. Compatible architectures for the HTS coated conductor layered structure must be considered. Modeling efforts must provide effective description of the growth mechanism, pinning process, ac loss, or stabilization issue and lead to optimization of the process/architectures. (2) Identify approaches and determine the best method to implement an in-situ diagnostic system for the growth of YBCO superconductor during film deposition leading to manufacturing process control. This task focuses on the development of advanced (perhaps optical or other) diagnostics for process monitoring of YBCO deposition and an investigation of growth dynamics to develop a better understanding of the mechanisms of film growth.

6. Research Classification/Restrictions: This research is FOUO but does not have ITAR restrictions.

7. Eligible Research Institutions:

Universities (DAGSI) AFIT USAFA