

**2010 Advanced Cables and Conductors Peer Review  
Project Summary**

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<b>Project Title:</b>	<b>Electrodeposited Stabilization Layers for High-Temperature Superconducting Coated Conductors (SuperPower CRADA)</b>
<b>Organization:</b>	National Renewable Energy Laboratory
<b>Presenters:</b>	Raghu Bhattacharya, Yunfei Qiao and Venkat Selvamanickam
<b>FY 2010 Funding:</b>	\$400 K

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**Overall Project Purpose and Objectives:**

The vision of the U.S. Department of Energy's states that "Low-cost, high-performance  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$  (YBCO)-coated conductors will be available in kilometer lengths." One of the critical actions to achieve this goal is to minimize the use of expensive materials (e.g., Ag) and also to develop low-cost technology for producing stabilization layers for YBCO superconductors. NREL's High Temperature Superconductivity (HTS) program is directed at electrodeposition of stabilization layers for second-generation (2G) YBCO superconductor materials. Electrodeposition is a potentially low-cost, non-vacuum, high-rate deposition process that can easily deposit uniform film on large non-planar substrates. We have CRADA agreements with SuperPower for electrodeposition of Ag and Cu-stabilization layers.

We had the following specific objectives for FY2010.

Consistent with the project's purpose and our significant progress in FY2009, our plan for FY2010 was to transfer the electrodeposited Cu and Ag-stabilizer technology to SuperPower and demonstrate meter long reel-to-reel electrodeposition.

**2010 Approach and Results:**

- We transferred the electrodeposited Ag and Cu-stabilizer technology to SuperPower.
- We developed an electroplated Ag-stabilization layer directly on a YBCO superconductor.
- We used TEM and SEM to conduct interdiffusion and structural studies of the YBCO/Ag stabilizer.
- We successfully fabricated meter long stabilization layers on YBCO superconductor.
- We published a book on "High Temperature Superconductors," edited by Raghu N. Bhattacharya and M. Paranthaman.

**2011 Plans and Expectations:**

Consistent with the project's purpose and successful technology transfer to SuperPower in FY2010, our plan for FY2011 is to continue to work with SuperPower on Ag and Cu-stabilization layer development. Except for cyanide copper electroplating, all of SuperPower's 2G wire manufacturing processes have been developed and are completed in-house with high throughput and lean manufacturing practices. Further reduction of 2G wire cost requires that a thin Ag-layer, and non-cyanide Cu and Ag electrodeposition processes be routinely operated in house. The expected outcome is a substantial reduction in cost of 2G YBCO superconductor tapes.

**Technology Transfer, Collaboration, Partnerships:**

NREL and SuperPower, Inc., are working together under a CRADA to develop electrodeposited stabilizer layers for YBCO-coated conductors. This year SuperPower and NREL submitted a joint 2010 R&D 100 Award Application titled, "High Throughput, Low Cost Copper and Silver Electrodeposition Process."