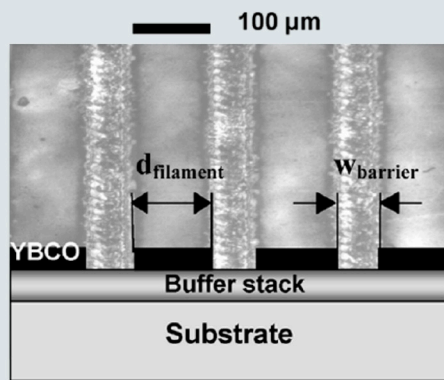


Superconductor with Improved Flux Pinning and Reduced AC Losses

UT-B ID 200701895



A filamented yttrium barium copper oxide (YBCO) sample with a cross-sectional drawing of a multifilamentary tape depicting a more ac-tolerant coated conductor.

Technology Summary

A new ORNL technique for making superconductor tapes and films promises significant reduction of energy losses in demanding high temperature superconductor (HTS) applications such as electric grids. The simple, inexpensive method separates the components into thin filaments and aligns the filaments more efficiently on a substrate.

The invention features second generation superconducting yttrium barium copper oxide (YBCO) wires and films. A major problem in superconducting materials has been poor alignment of grains in the HTS films or coating of the substrate. Superconducting applications typically involve ramped magnetic or oscillating magnetic fields or require that the HTS wire carry alternating current (AC); as a result, energy dissipation occurs. Poor grain alignment contributes to the AC losses. The ORNL method improves the ability to modulate AC losses, while also making it possible to incorporate filamentized or plate-like layer structures within the superconducting film.

The technique involves depositing a layer with at least two phase-separable components onto a substrate with two axes. This technique achieves nanoscale phase separation of the layers. A superconducting film is then deposited multidirectionally onto the phase-separated layer so that the nanoscale features of the layer are propagated into the superconducting film.

Advantages

- Simple and inexpensive method for incorporating nanoscale defects and/or filamentized features into superconducting films
- Provides superconducting films with increased flux pinning and reduced AC losses
- Modulates the level of AC loss reduction, flux pinning, and other attributes of the superconducting film by appropriate adjustment of the concentration of phase-separable components

Potential Applications

- HTS wire/cable in electric grids
- Fault current limiters
- HTS dynamic synchronous condensers

Patent

Amit Goyal, *Superconductor Films with Improved Flux Pinning and Reduced AC Losses*, U.S. Patent Application 12/242,021, filed April 1, 2010.

Inventor

Amit Goyal
Materials Science and Technology Division
Oak Ridge National Laboratory

Licensing Contact

Alexander G. DeTrana
Technology Commercialization Manager, Materials
Science
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865.576.9682
E-mail: detranaag@ornl.gov

