National Science Foundation

Probing and Manipulating Superconductivity in Nanostructures

Judy Wu University of Kansas DMR-1105986

Objectives:

Design 3D impurity nanostructures in superconductors for enhanced vortex pinning and hence electrical current-carrying capability.

Approaches:

Integrated theoretical modeling of elastic strain and experimental exploration micro-strain manipulation

Impacts:

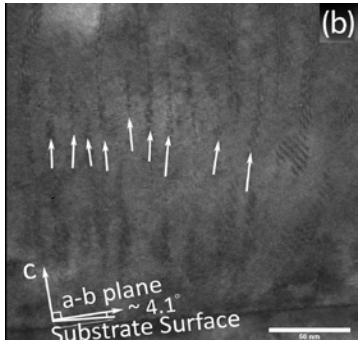
•High-Tc superconductor cables and systems for power transmission, generation and energy storage

•Education of PhDs in material design and material fabrication with nanoscale control of morphology, crystallinity and electrical properties

Accomplishments:

•Developed methods to generate nanotubes and nanorods with controllable morphology in YBCO films and achieved record high J_c

• Developed a theoretic model based on elastic strain theory to understand the strain-mediated nanorod configuration.



Strain-mediated alignment of BZO nanorods in YBCO films

Prediction of nanorods orientation