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.

Prediction of nanorods orientation

Strain-mediated alignment of BZO nanorods in YBCO films