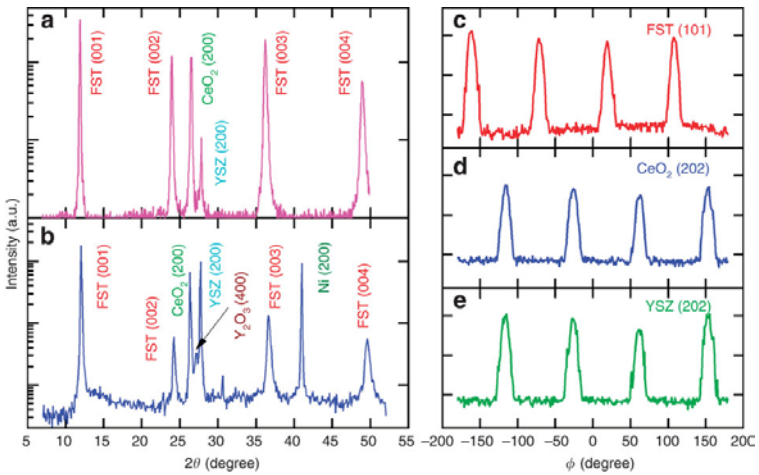
Breakthrough Iron-based Superconductors Set New Performance Records

Scientific Achievement

Created high-performance iron-based superconducting wire that carries tremendous current under exceptionally high magnetic fields – an order of magnitude higher than those found in wind turbines, MRI machines and even particle accelerators

Significance and Impact

Opens new pathways for essential and energy-intensive technologies world-wide



Structural analysis of FST films by x-ray diffraction: (**a**) YSZ single-crystalline substrate with CeO_2 buffer layer and (**b** RABiTS substrate. *Φ* scan of (**c**) (101) peak from the FST film, (**d**) (202) peak from the CeO_2 buffer layer and (**e**) (202) peak from YSZ buffer layer in FST film grown on RABiTS subtrate.

Research Details

- Synthesized novel film of iron, selenium, and tellurium to push existing performance parameters
- Key breakthrough: adding layers of cerium-oxide in between films and substrates dramatically increased superconductor's maximum electricity load, as well as the critical temperature at which material becomes superconducting; x-ray diffraction confirmed understanding of why films work well
- Demonstrated using single crystals as well with thin films grown on flexible metallic materials called rolling-assisted biaxial textured substrates, or RABiTS, which have important implications for long-length scaled-up production in the future

W Si, SJ Han, X Shi, SN Ehrlich, J Jaroszynski, A Goyal, Q Li, Nat. Commun. 2013 4:1347

Work was performed at Brookhaven National Laboratory