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

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

Structural analysis of FST films by x-ray diffraction: (a) YSZ single-crystalline substrate with CeO₂ buffer layer and (b) RABiTS substrate. Φ scan of (c) (101) peak from the FST film, (d) (202) peak from the CeO₂ buffer layer and (e) (202) peak from YSZ buffer layer in FST film grown on RABiTS substrate.

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

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