Field-effect Transistors Get a Boost from Ferroelectric Films

Scientific Achievement
Developed a complex metal oxide film using ferroelectric materials that allow for switching of polarization without the use of a conducting bottom electrode

Significance and Impact
These films could allow for smaller microelectronic devices that reduce voltage required to switch electronic signals and maximize output without excess heat

Research Details
- Performed x-ray diffraction to characterize tetragonality, or “out-of-squareness,” of the crystal structure within the film; crystal units found to have correct electrical polarization to make good transistors
- Used piezoresponse force microscopy to determine that ferroelectric switching films could be produced at 8 to 40 nanometers thick, though a thickness of just 10 nanometers proved best to ensure polarity was evenly distributed across the film


Work was performed at Brookhaven National Laboratory, Oak Ridge National Laboratory, University of Texas at Austin, and IBM