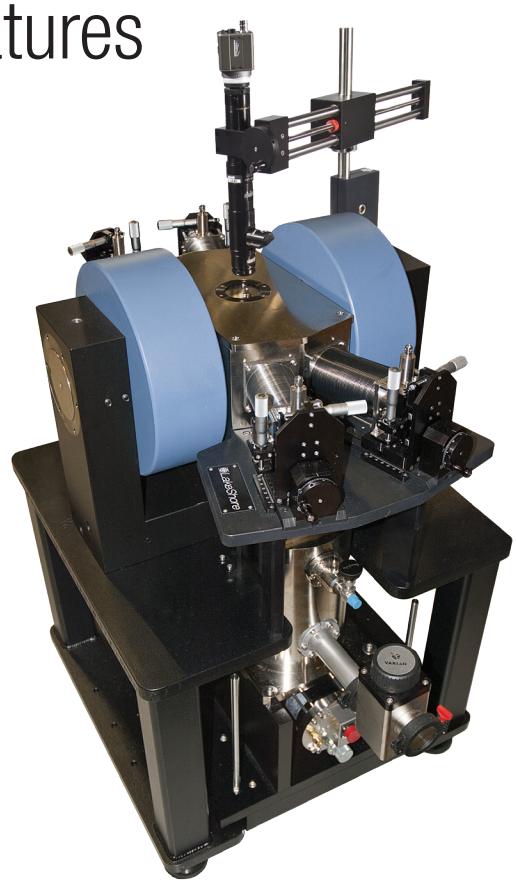
Rapidly Characterize Ferroelectric Devices over Variable Temperatures

Introduction

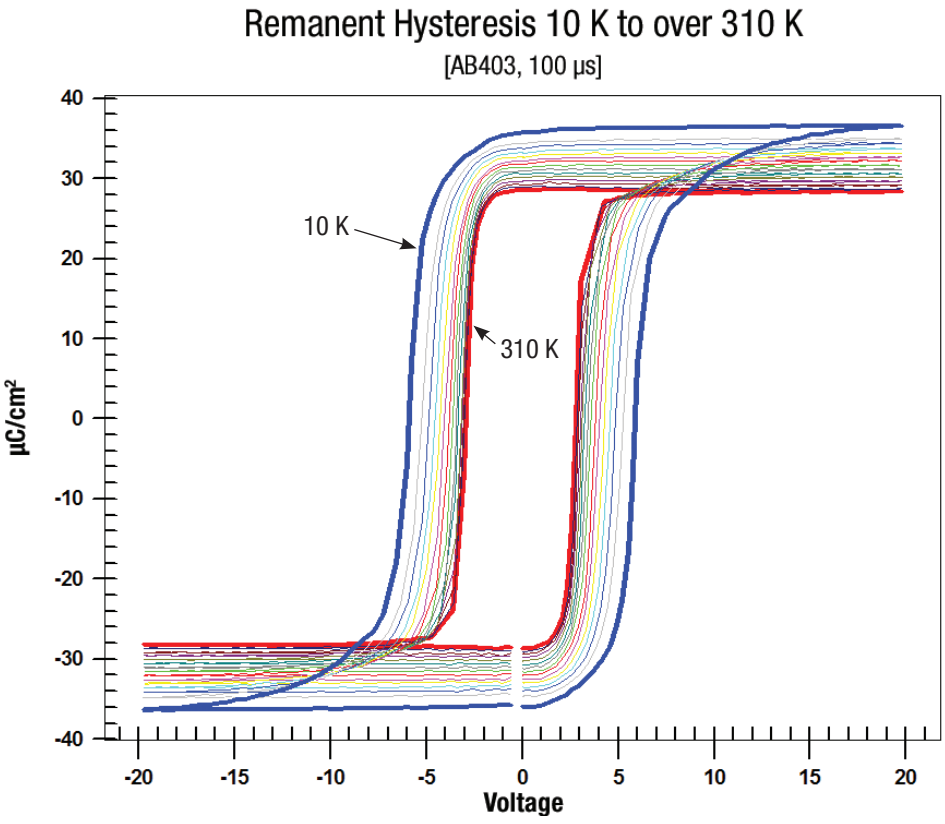
Ferroelectric materials are used in a wide variety of applications, including sensors, ferroelectric memory (FeRAM), MEMs devices, actuators, and photovoltaics. Rapid assessment of ferroelectric device characteristics is critical to improving ferroelectric materials processing as well as developing accurate ferroelectric device models. The combination of Radiant ferroelectric test solutions and Lake Shore probe stations offers researchers a flexible platform to efficiently characterize multiple devices in a cryogenic probing environment. The addition of cryogenic temperature characterization can open new frontiers to understanding dielectric properties, switching mechanisms, and fatigue in ferroelectric materials.





Measurements include:

- Hysteresis vs. temperature
- Leakage vs. temperature
- Hysteresis speed vs. temperature
- Remanent hysteresis vs. temperature
- PUND remanent polarization vs. temperature
- PUND frequency response vs. temperature
- Breakdown voltage vs. temperature
- IV vs. temperature
- CV vs. temperature
- Fatigue vs. temperature
- Retention vs. temperature
- Imprint vs. temperature

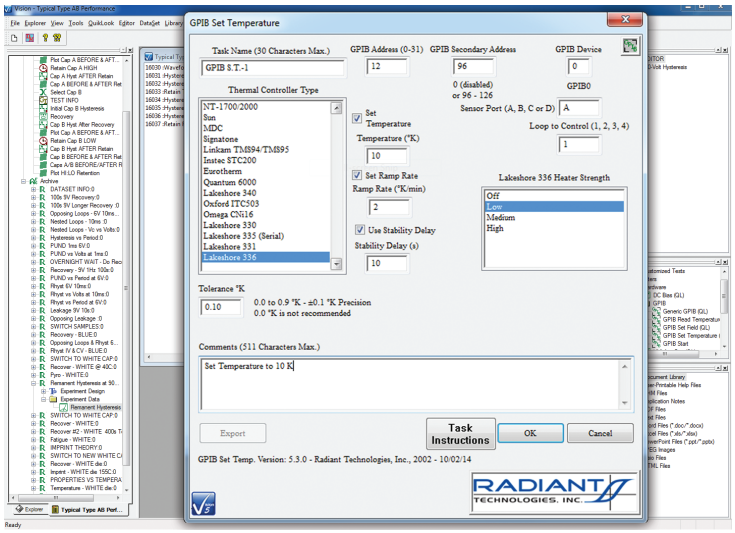


Remanent hysteresis vs. temperature—40,000 µm² 20/80 PZT measured in a Lake Shore CRX-4K probe station

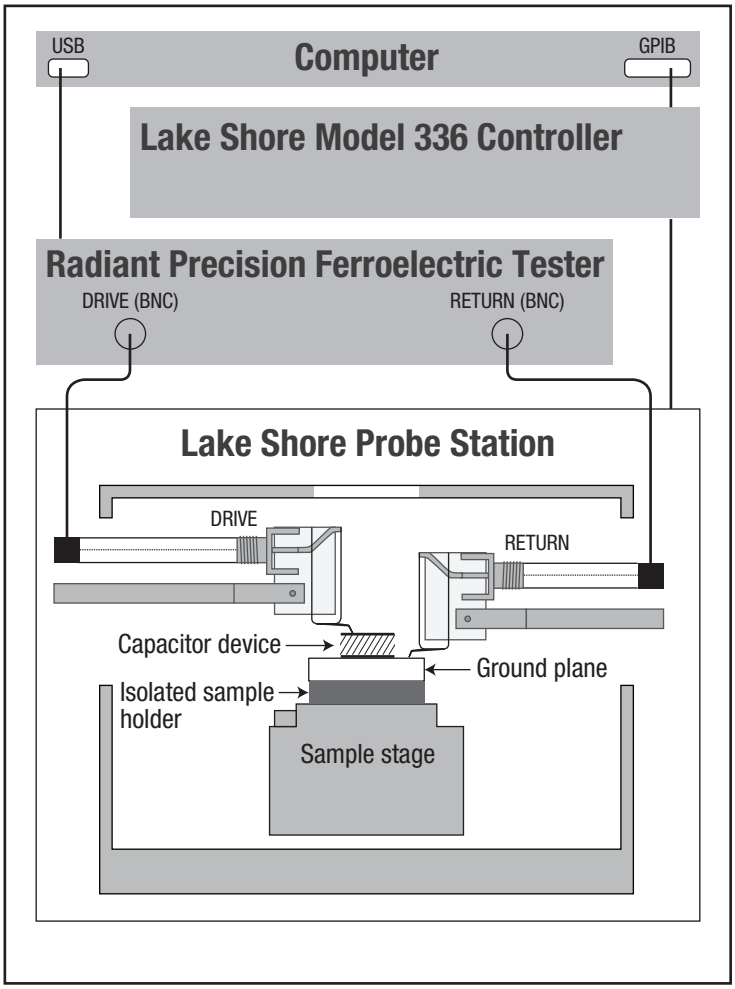
RADIANT TECHNOLOGIES, INC.

Lake Shore CRYOTRONICS
a **DwyerOmega** brand

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Vision™ data acquisition software enables plotting of multiple temperature measurements as well as custom programming to create your own test profile



Lake Shore cryogenic chamber and Radiant's test system easily interface. Vision™ software controls the Lake Shore unit via the Lake Shore Model 336 temperature controller.

Probing environment

Lake Shore's cryogenic probe stations are versatile and flexible research platforms which provide precisely controlled environments for non-destructive measurement of the electrical properties of materials and electronic devices. When combined with Lake Shore's patented continuously variable temperature (CVT) probe, true unattended wafer probing of a device across a range of temperatures is achieved. The CVT probe design absorbs probe arm movement caused by thermal expansion and contraction, resulting in a stable probe tip landing position throughout variable temperature cycling.

Easy interface

Lake Shore probe stations easily interface with Radiant Technologies, Inc. Ferroelectric/Multiferroic Test Systems to provide fast and accurate testing of ferroelectric and piezoelectric materials as a function of temperature.

Easy programming

Radiant's data acquisition program executes automated tests of single samples over a wide temperature range, making long duration testing effortless.

Combined with a Lake Shore probe station and Model 336 controller, temperature setpoints can be pre-programmed. The software can be configured for different measurements and generate multiple plots at the touch of a button. These plots (in a single pass on a single sample) include but are not limited to:

- Measure and plot hysteresis
- Remanent polarization
- Leakage
- Small signal capacitance
- Thermally engineer ferroelectric components
- Set variable temperature measurements
- Measure phase boundaries
- Measure coercive voltage changes
- Measure switching speeds
- Measure device leakage

For more information

Contact Lake Shore so we can configure the right probe station and precision test platform for your application—supplied jointly by Lake Shore and Radiant.

For more information about Lake Shore probe stations, see **www.lakeshore.com**