

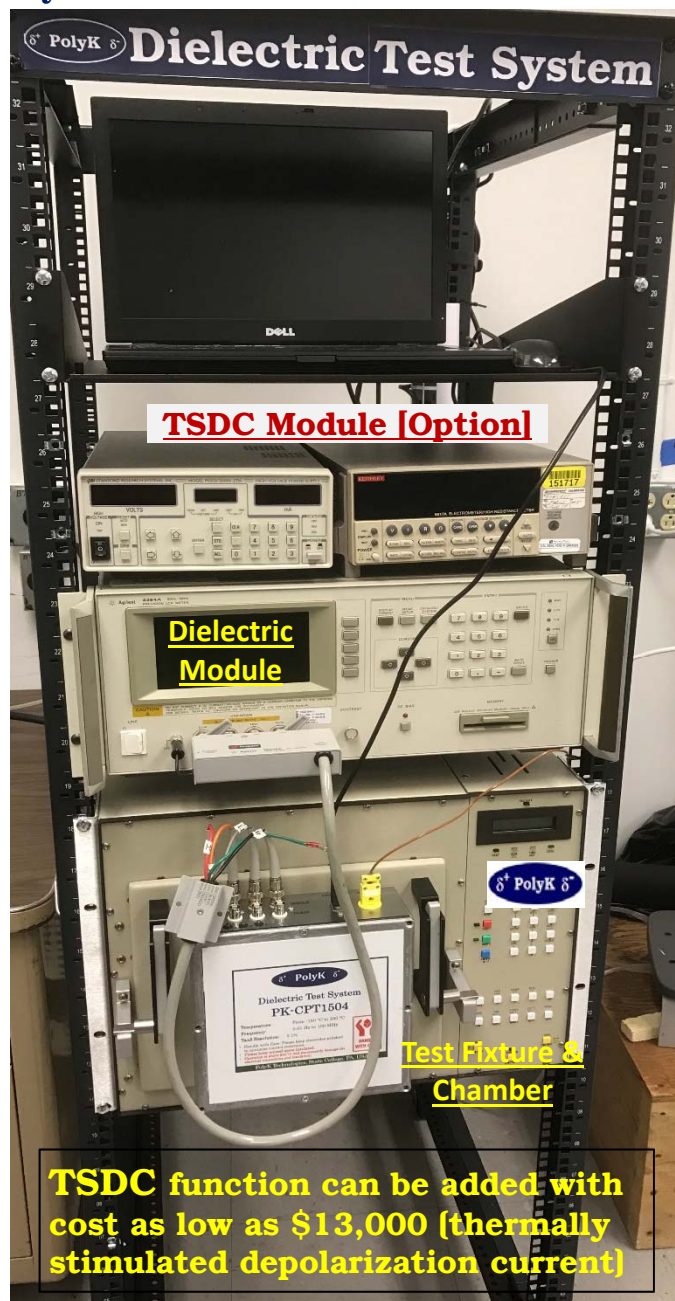
Turnkey Dielectric Spectroscopy

Measure dielectric constant & $\tan \delta$ as a function of
Temperature & Frequency

δ^+ PolyK δ^-

Capability

- This low-cost turnkey test system can be used to measure capacitance (dielectric constant) and dissipation factor or other types of complex impedance parameters of dielectric materials as a function of temperature and frequency.
- It includes a temperature chamber, test fixture with five specimens, Agilent LCR meter 4284A (or others), a laptop computer with test control program + connection cables.
- The test fixture is integrated with a temperature chamber with shielded low impedance high temperature fixture.
- Temperature High: 250 °C, all connections are rated for 250 °C with Teflon or Kapton insulation.
- Temperature Low: the chamber has liquid nitrogen cooling adapter < -150 °C test.
- Frequency: recommended for 20 Hz to 1 MHz (4TP shielded connections) with Agilent 4284 LCR meter. Also work with other meters (Keysight E4980, 4294A etc.)
- High Sensitivity: can accurately measure dielectric dissipation factor $\tan \delta < 0.1\%$
- Multiple Specimen Test: during one temperature ramp, up to 4 samples can be tested with shielded relays to automatically switch between samples.
- Specimen 0 is directly connected to LCR meter without relay for high sensitivity test.
- Grounding electrode made with 99.9% silver plate for high electrical conductivity (Ag_2O is still conductive).
- Top probes are spring loaded and gold-plated. The force of the spring can be adjusted by users. Perfect for measuring soft polymer samples with minimal damages.
- One additional thermocouple installed close to samples under test and the temperature can be recorded by the test program. The air temperature of the chamber is also recorded by the LabView program.
- Include computer program that automatically control the test temperature, frequency, and time.



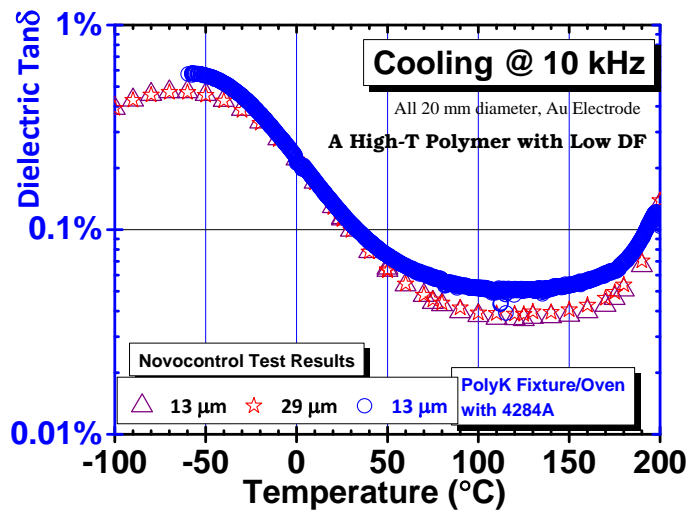
Applications

1. Develop new dielectric and ferroelectric polymers and nanocomposites.
2. Complementary to DMA (dynamic mechanical analyzer), study polymer relaxation process, glass transition process, aging/annealing process,
3. Study the curing kinetics of thermosetting materials.

Example Test Results

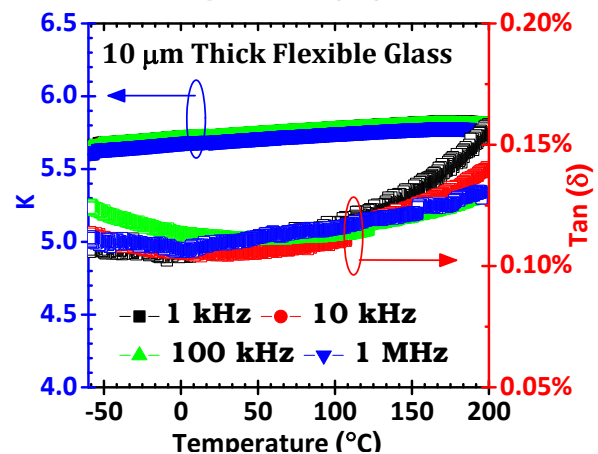
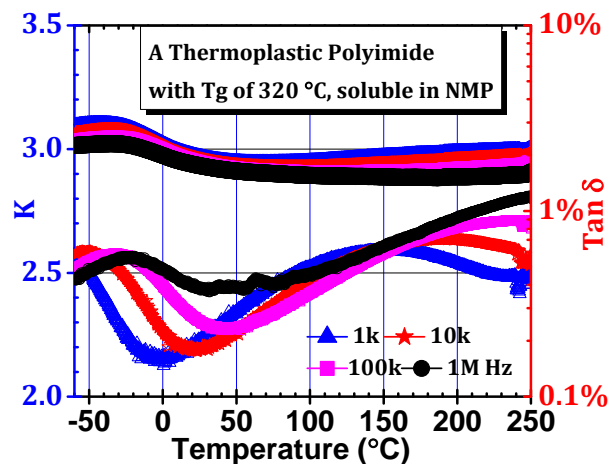
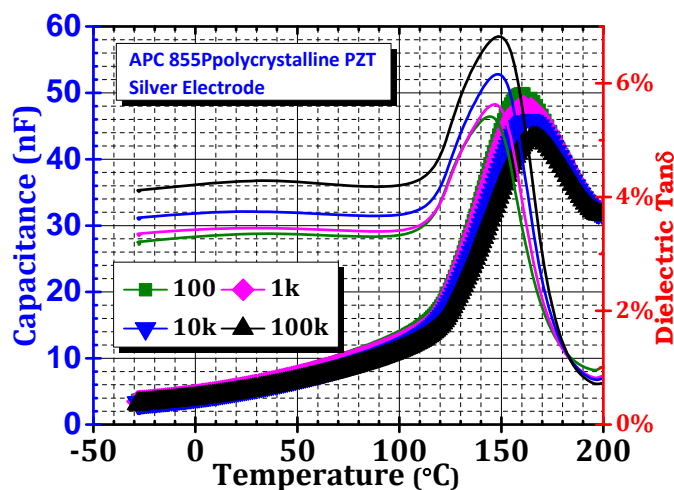
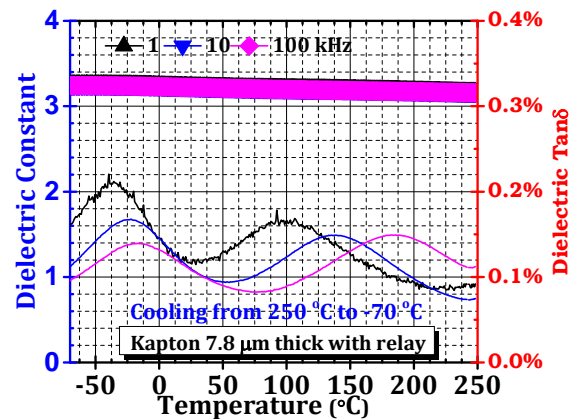
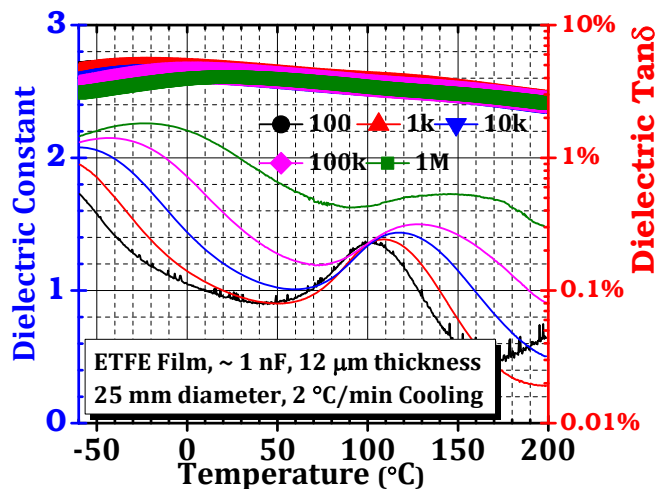
Potential customers can send samples for a test run before purchasing.

δ^+ PolyK δ^-



Benchmark with Novocontrol (Concept 80, α -Analyzer)

- Polymer film samples with 20 mm diameter and 13-29 μm thickness ($K \sim 3$), with 60 nm thick gold on both surfaces, ~ 600 pF capacitance, measured by both Novocontrol and PolyK test system.
- PolyK test system measured similar dielectric loss $\tan\delta$ as the Novocontrol, even though the $\tan\delta$ is lower than 0.1%.

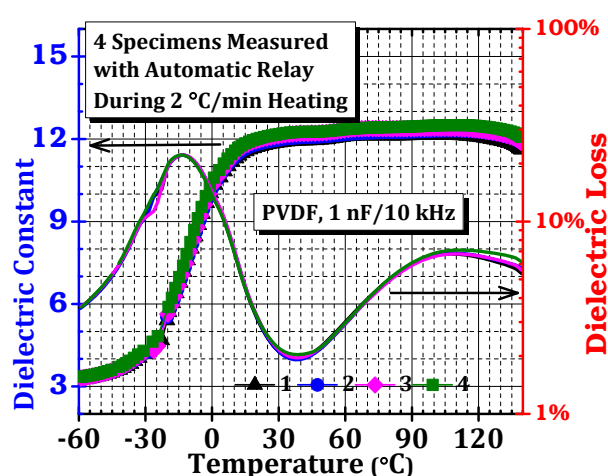
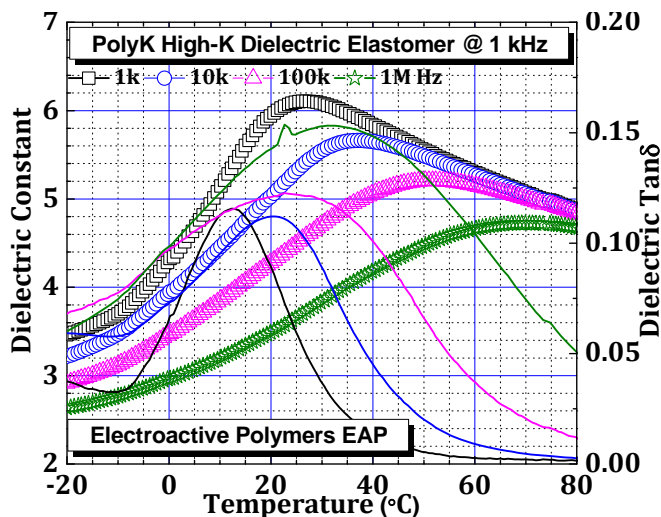
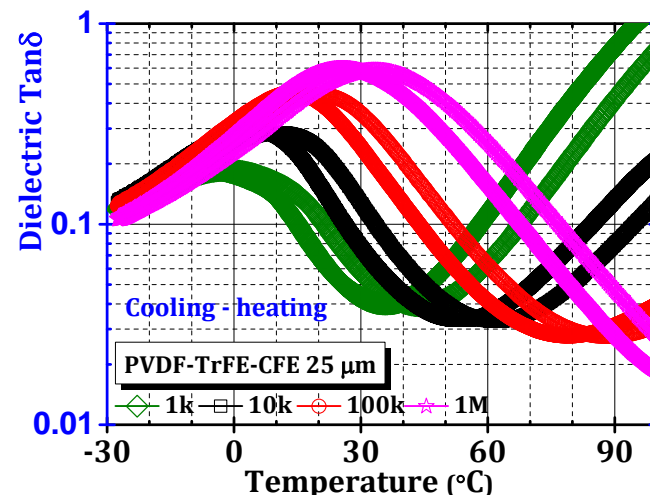
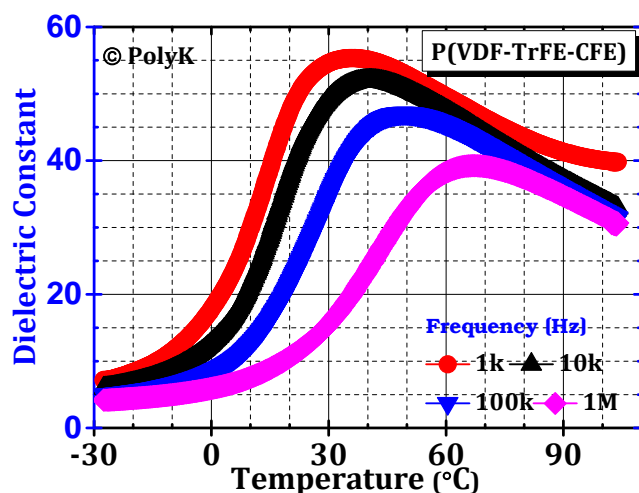
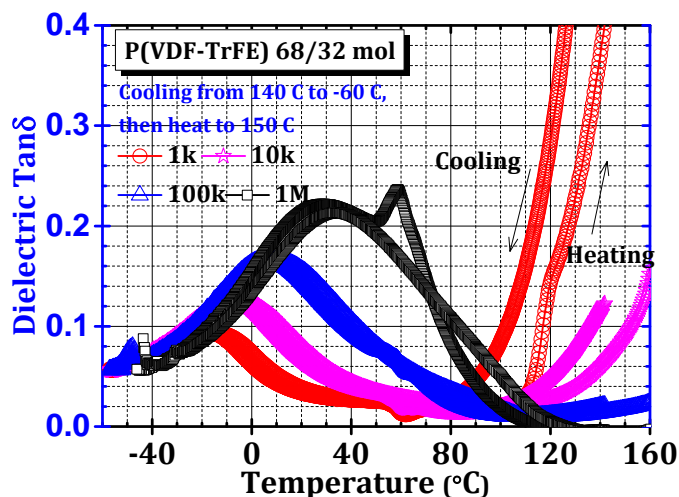
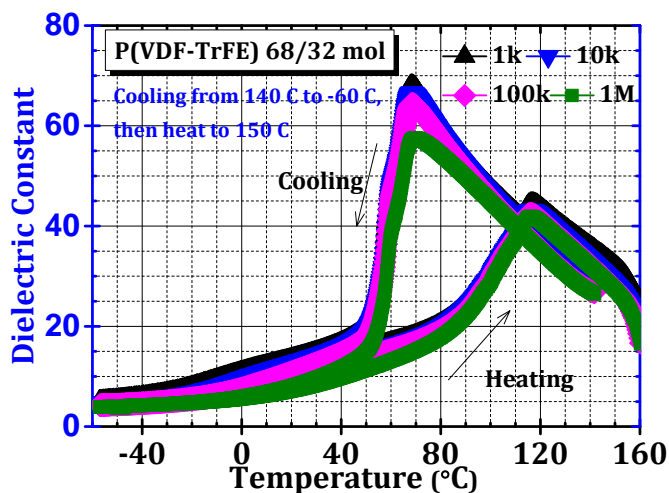


**All these films/materials are available
for sale for R&D.**

Example Test Results: Fluoropolymers

Potential customers can send samples for a test run before purchasing.

δ^+ PolyK δ^-

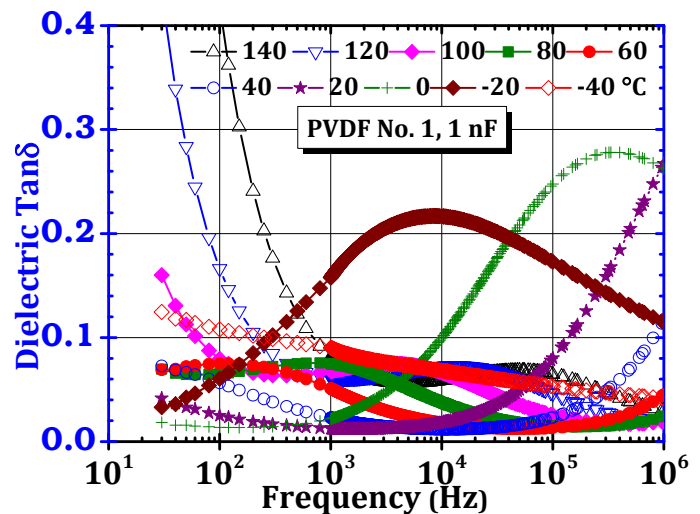
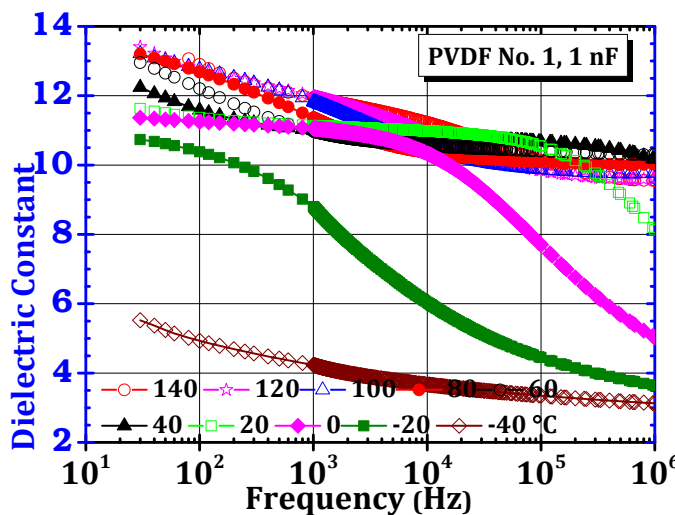
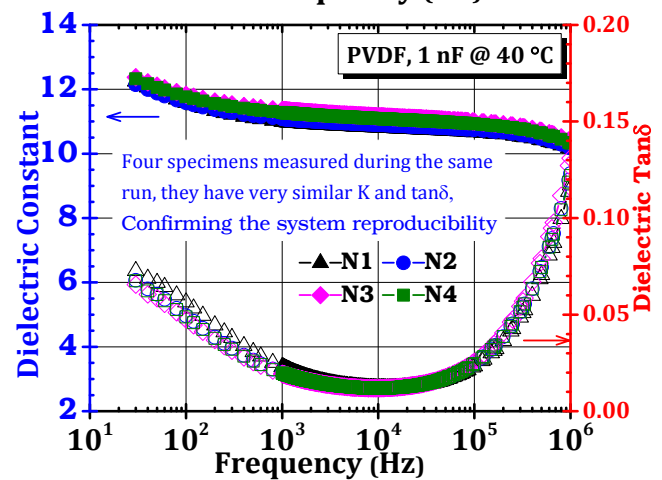
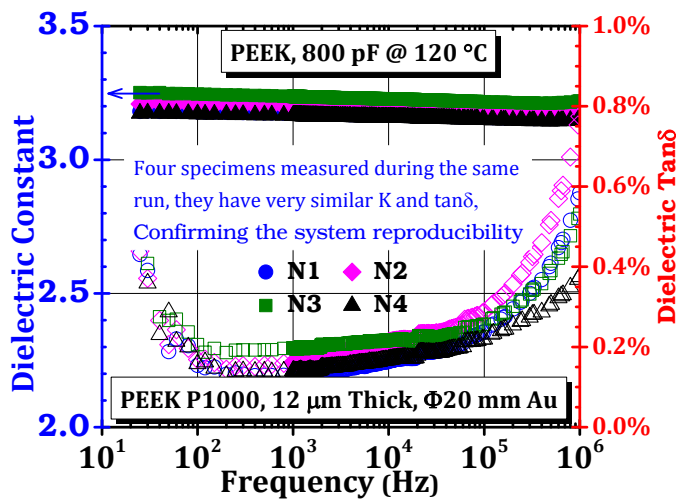
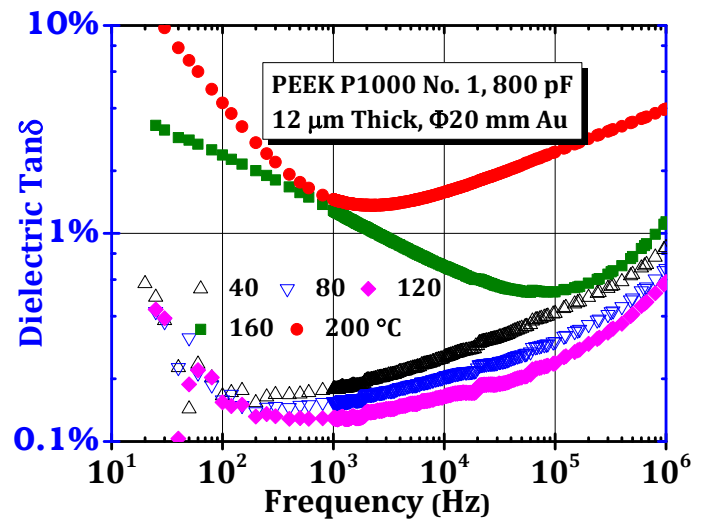
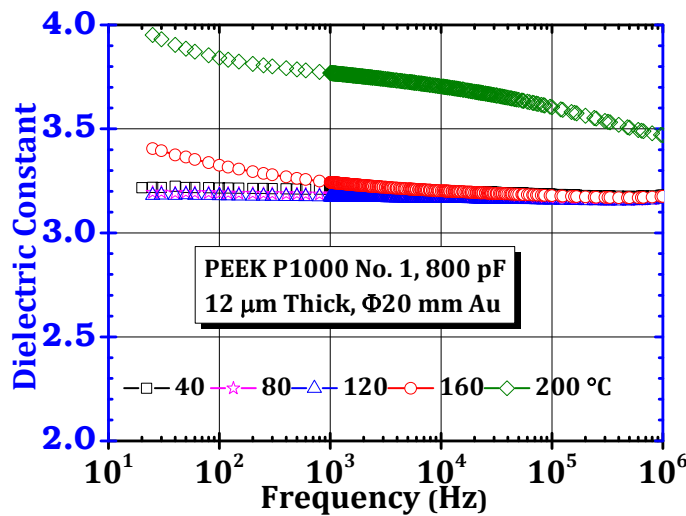


PolyK has a collection of various fluoropolymer resins and films for R&D customers. Some films are either uniaxially oriented or biaxially oriented.

PolyK has various high-temperature dielectric materials and films for R&D customers. We are specialized in ultrathin film with thickness from 1 um to 10 um.

Example Test Results: Isothermal Test

Potential customers can send samples for a test run before purchasing.

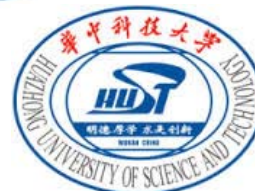
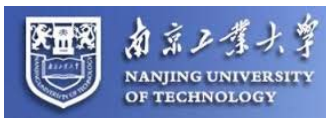


PolyK is specialized in high voltage dielectric materials and test systems.

We offer: (1) Ferroelectric and Polarization Loop measurement system; (2) High voltage high temperature leakage current and pyroelectric test system; (3) Capacitor Charge-discharge test system; (4) High voltage and dielectric test services; (5); DSC/DMA/FTIR test services; (6) Film Processing services (extrusion, MDO); (7) PVDF Piezo film

Current Customers

δ^+ PolyK δ^-



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