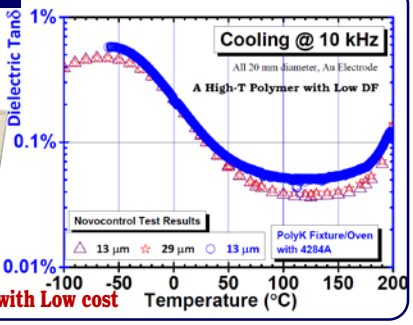
PolyK *Specialized in high voltage polymer dielectric, piezoelectric, and smart materials and their applications (capacitors, sensors, actuators, energy harvesting)*

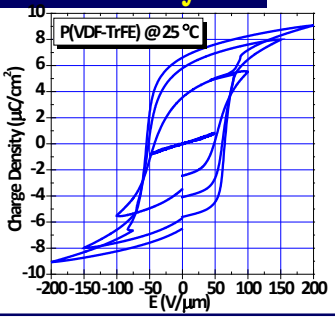
Low-Cost Turnkey Dielectric Test System

Capacitance (dielectric constant) and **loss tanδ** vs. frequency and temperature: Integrate Agilent 4284A (E4980A) Precision LCR meter with temperature chamber (liquid nitrogen cooling) with LabView Control Program. Multiple specimens. Up to 250 °C, DF accuracy<0.1%. **Cost < $20K**



Modular design: Can expand to TSDC with Low cost

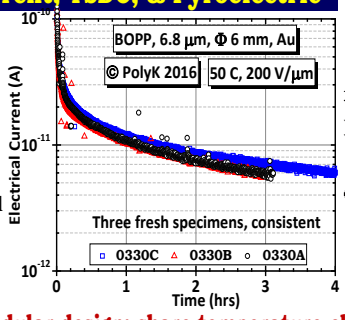
Ferroelectric Polarization Loop & Dielectric Breakdown Test System

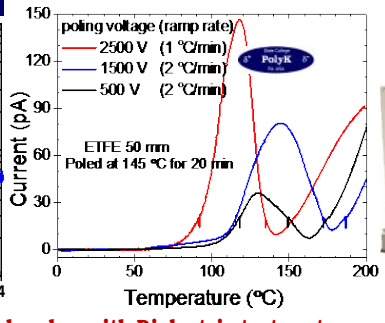


Including a computer & used Trek amplifier for **<$10,999**. Sample test fixture for soft polymer films. Software can directly provide charged and discharged energy density, and perform lifetime test with a summary file of energy density vs. test cycles.

High Voltage Leakage Current, TSDC, & Pyroelectric

- Test voltage up to 10 kv
- Temperature: -150 °C to 300 °C
- High sensitivity, leakage current accuracy < 1 pA
- Multi functions in one: TSDC, pyroelectric & leakage current
- Spring-loaded electrode to maintain minimum force to avoid damage to thin or soft specimen.
- Guard-ring for ASTM D257 test.
- Automatic computer-controlled TSDC test
- Cost may be as low as $20K

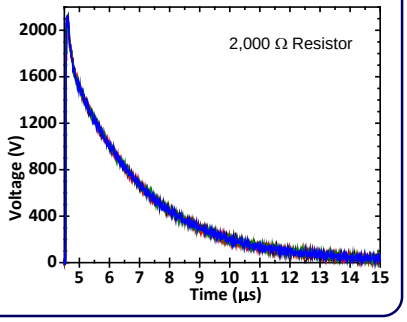




Modular design: share temperature chamber with Dielectric test system

Capacitor Charge-Discharge Test System

- Directly measure the discharge speed and energy of capacitive samples at speed of 100 ns
- Voltage >15 kV
- Capacitance: 10 pF to >1 mF
- Computer control, capable of life-time cycle test
- Specially designed for evaluating dielectric film (100 pF-10 nF) with switches with minimal parasite capacitance



Everything About Dielectric, Piezoelectric & Ferroelectric R&D

- Dielectric & Ferroelectric Materials: PVDF, PVDF-TrFE, PVDF-TrFE-CFE, PVDF-HFP, PVDF-CTFE, PVDF-TFE, PTFE-VDF-HFP, different Mw
- Piezoelectric Film: customized, high d33 & d31
- Ultrathin Free-Standing Film: 0.9 um to 100 um,
- Refurbished Trek Amplifiers, LN2 cooled chambers, sputter coaters, electrometers, etc with warranty.
- Thin Film Manufacturing Machines and Service: melt extrusion, R2R solvent casting, orientation & stretching, from <1 m to >1,000 m
- Refurbished Trek high voltage amplifiers, gold sputtering machines, temperature chamber
- Special piezoelectric test systems, d31, d33, etc.
- M.I.T. folding endurance tester ASTM D2176

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Capable of developing customized automatic electrical & piezoelectric test systems

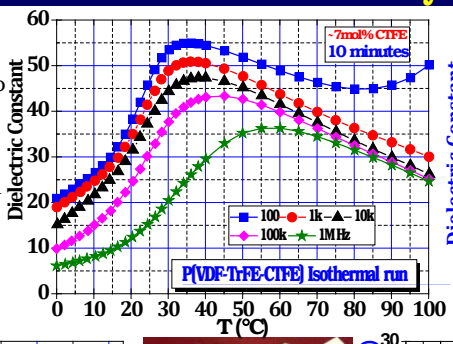
Everything About Dielectric, Piezoelectric & Ferroelectric R&D

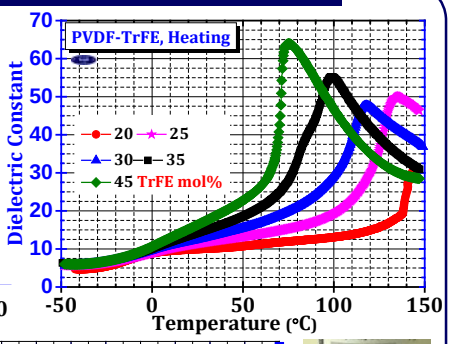
δ+ PolyK δ-

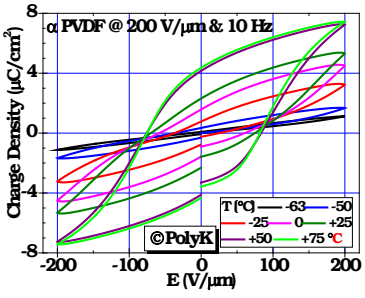
PVDF, PVDF-TrFE, PVDF-TrFE-CFE Electroactive Polymers EAP: Resin & Film

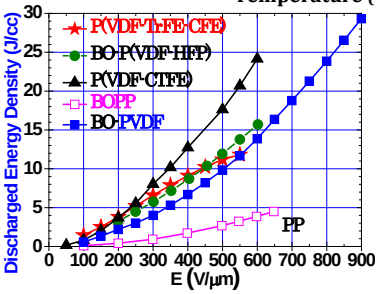
Collection of >50 different PVDF-based polymers and films

- High-K Terpolymer: dielectric constant >50 (no filler) & dielectric breakdown >400 MV/m
- Piezoelectric Film: poled PVDF with high d33 and d31, <10 um to >100 um thick
- High-K Dielectric Elastomer: for actuators and energy harvesting
- Oriented PVDF with dielectric breakdown > 700 MV/m: high energy density capacitors
- High Mw PVDF for battery binder
- Low Mw PVDF for electrospinning





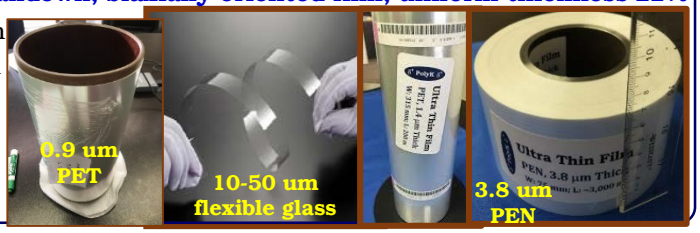




Ultrathin Dielectric Film: Free-Standing, Pinhole-Free, 0.9 um to >100 um

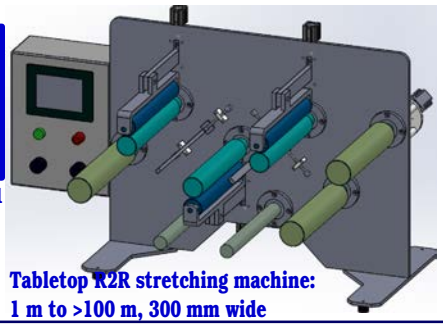
Capacitor-grade film: minimal defect, high dielectric breakdown, biaxially oriented film, uniform thickness ±2%

- BOPP: 1.9 um, 2.4, 3.0, 3.8, 4.5, 4.8, 5.8, 6.8, 7.8, 9.8 um
- PET Mylar: 0.9 um, 1.4 um, 2.0, 2.5, 3.0, 3.5, 4.5, 6.0 um
- PEN: 2.0 um, 2.5 um, 3.0, 4.0, 5.0, 6.0, & 8.0 um
- PPS: 4.0 um, 6.0 um, 9.0 um
- PVDF, PVDF-HFP, PVDF-CTFE, PEI, PEEK, PEI, PC, etc
- Flexible glass with thickness from 10 um to 50 um, K = 6

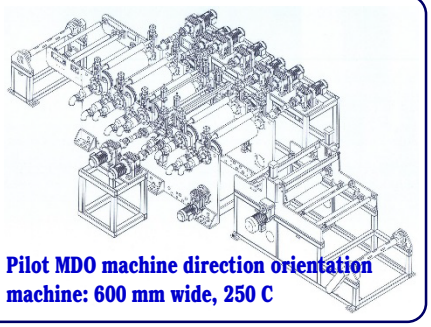


Special Film Machines

Low-Cost high-speed MTI folding endurance test with digital counter, ASTM D2176



Tabletop R2R stretching machine: 1 m to >100 m, 300 mm wide

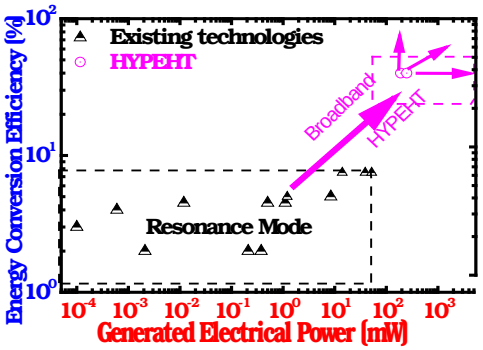


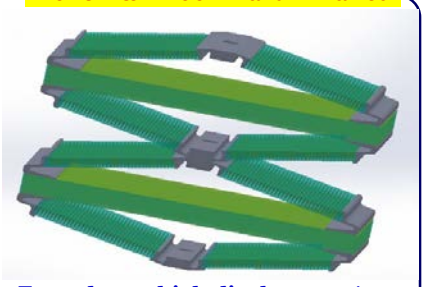
Pilot MDO machine direction orientation machine: 600 mm wide, 250 C

Piezoelectric Energy Harvester & Transducer

2016 R&D 100 Award Finalist

Convert mechanical vibration to electrical energy, high efficiency (>40%) and >100 mW output





Transducer: high displacement and large blocking force, operation at cryogenic temperature

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