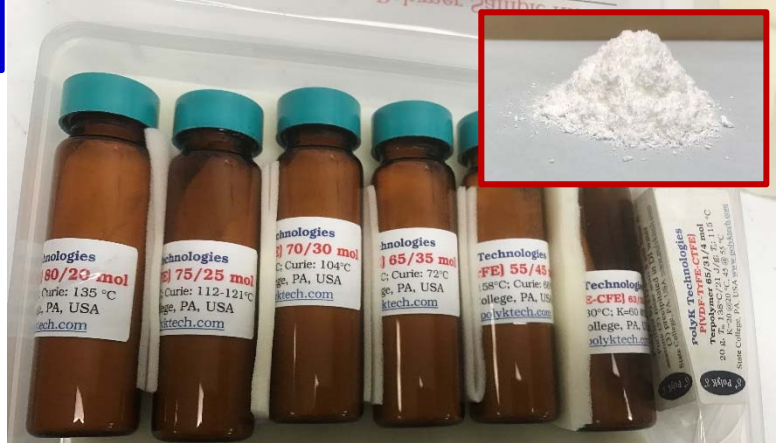


## Piezoelectric, Ferroelectric, Pyroelectric & Electroactive Polymer Kit: P(VDF-TrFE)

Polymer kit for R&D in capacitor, piezoelectric, pyroelectric, electrocaloric ECE, & electroactive polymer EAP. Include **20 grams** of each of **7** typical polymer resins based on P(VDF-TrFE).

1. P(VDF-TrFE) 80/20 (mol), Curie: 135 °C
2. P(VDF-TrFE) 75/25 (mol), Curie: 112-121 °C
3. P(VDF-TrFE) 70/30 (mol), Curie: 104 °C
4. P(VDF-TrFE) 65/35 (mol), Curie: 72 °C
5. P(VDF-TrFE) 55/45 (mol), Curie: 66 °C
6. P(VDF-TrFE-CFE) Terpolymer 63/30/7 (mol),  $T_m$ : 130 °C. Ferrorelaxor polymer with high dielectric constant ~60 at 25 °C.
7. P(VDF-TrFE-CTFE) Terpolymer 65/31/4 (mol),  $T_m$ : 130 °C. Ferrorelaxor polymer with high K~60 at 50 °C and 1 kHz.

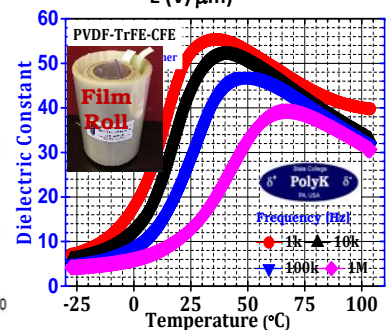
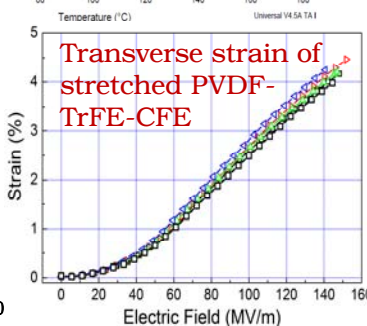
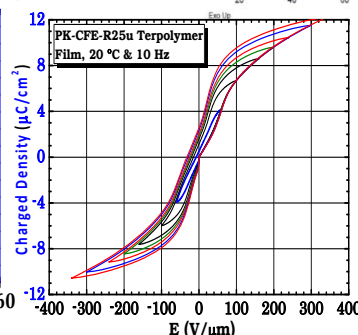
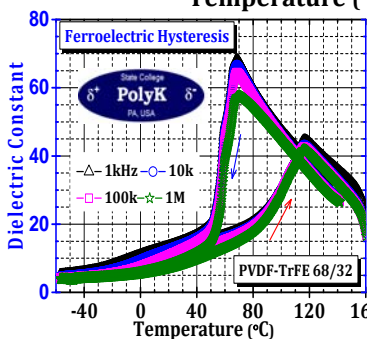
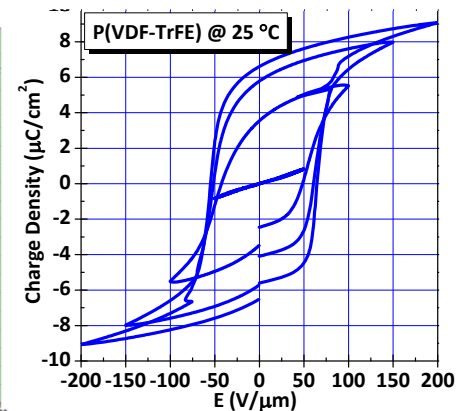
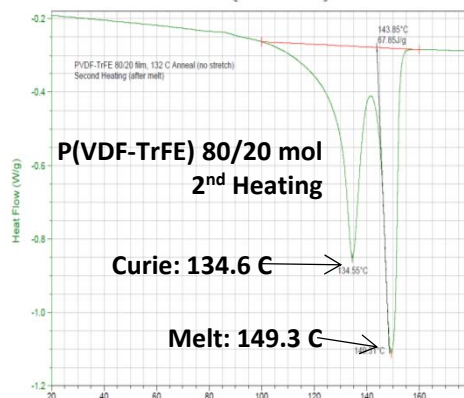
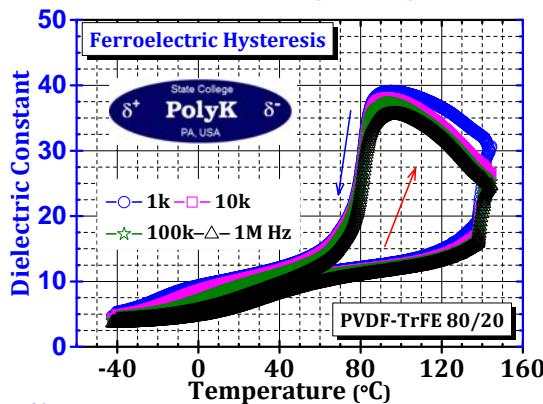
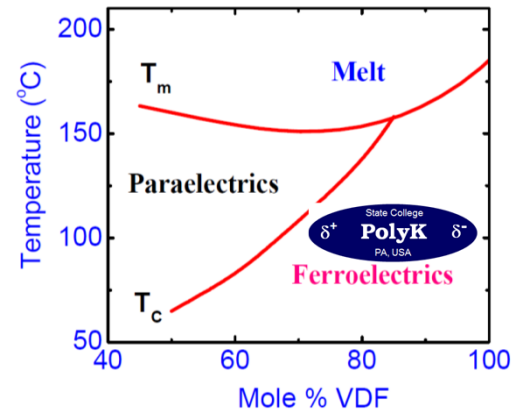
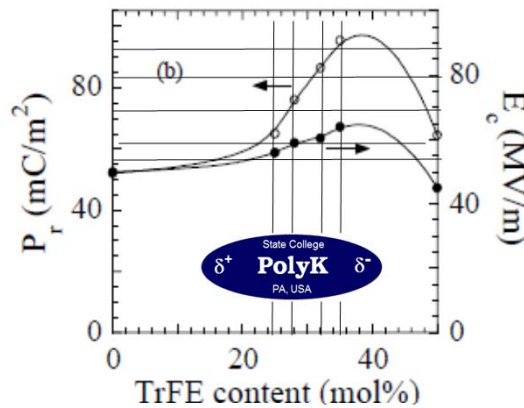
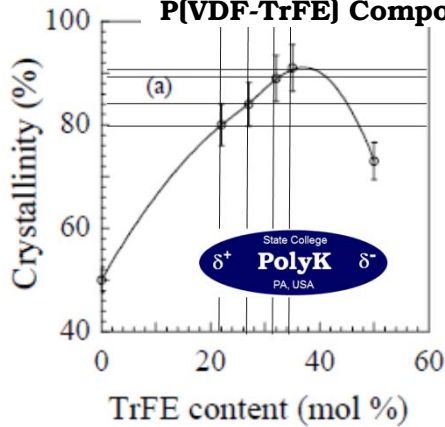
### Poly(vinylidene fluoride-co-trifluoroethylene) copolymers & terpolymers (CFE, CTFE)



**Produced by Suspension Polymerization with Minimal Side Chain Defects and high Crystallization Temperature & Degree**

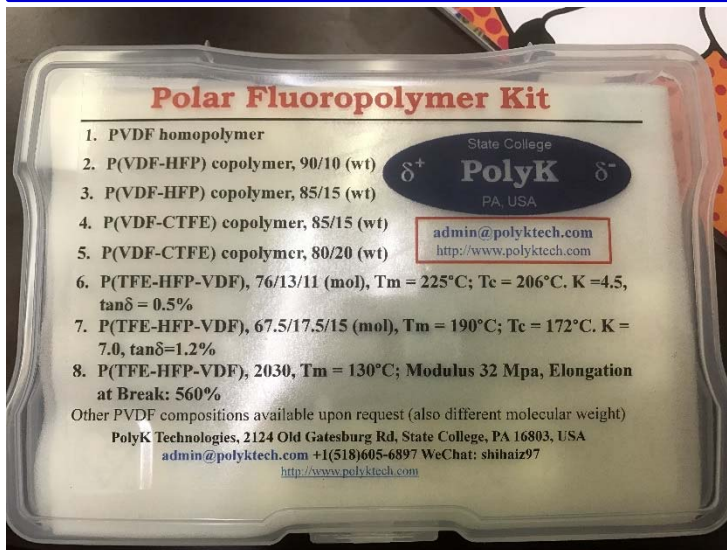
Other compositions available upon request

**P(VDF-TrFE) Composition Effect** (from Q.M. Zhang, 2001)

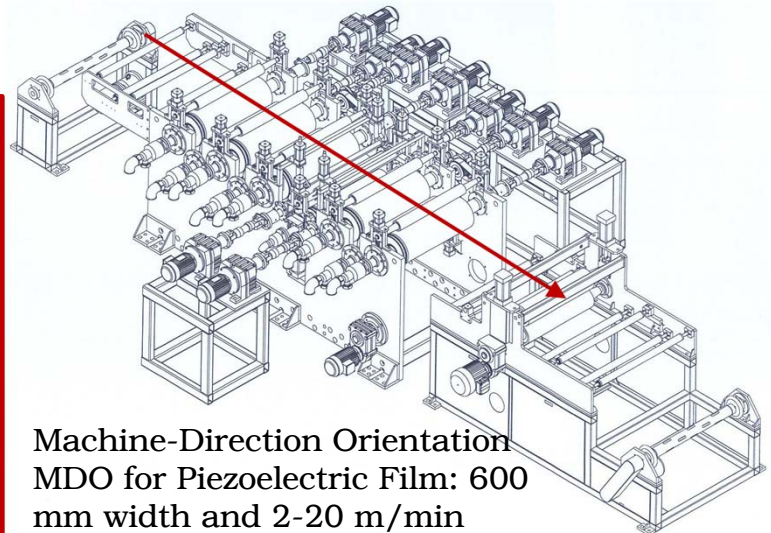


## Dielectric Polymer Kit: PVDF-Based Polar Fluoropolymers

Polymer kit for R&D in capacitor, piezoelectric, pyroelectric, electrocaloric ECE, & electroactive polymer EAP. Include **20 grams** of each of **8** typical polymer resins based on PVDF.



### Polyvinylidene fluoride [PVDF] & Copolymers



- Other PVDF compositions also available
- PVDF homopolymers with different molecular weight: ultra-low MW for electrospinning and ultra-high MW for battery binders
- PVDF-based polymers from Solvay (SOLEF), Arkema (Kynar), 3M (Dyneon), Kureha, China
- TFE-VDF based copolymers with high melting temperature and high dielectric constant
- Small quantity of 20 g to large quantity of 5 kg: commercial products with high quality
- Film based on PVDF: solvent cast, extruded, uniaxial orientation, biaxial orientation, poling, metallized
- Film thickness: 2  $\mu\text{m}$  to  $>100 \mu\text{m}$
- PVDF piezoelectric film and actuator film (beta phase film)



### Dielectric, Piezoelectric R&D

- Polymers: fluoropolymers of VDF with over 20 compositions & molecular weight
- Films: solvent cast, extrusion, poled, electrode, 1-100  $\mu\text{m}$
- Low-Cost Test Equipment: polarization loop, dielectric constant vs temperature & frequency, leakage current
- Device: piezoelectric sensors, capacitors, actuators, etc

