MEASUREMENT SPECIALTIES

Piezo Film Sensors

Technical Manual

Internet Version

Part 4 of 18

Temperature Effects

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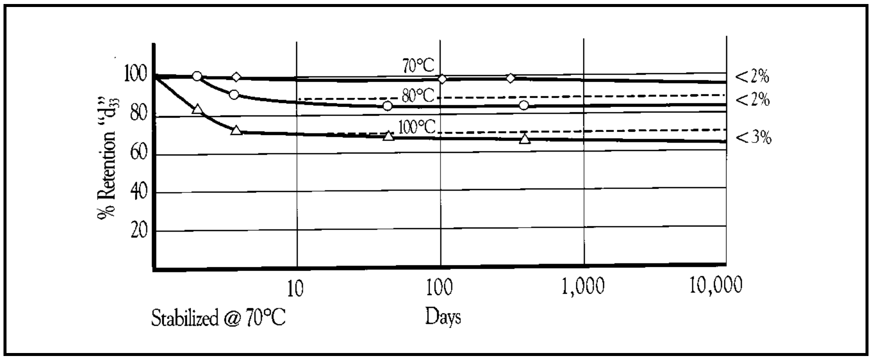
TEMPERATURE EFFECTS

Many of the properties of piezo film change with excitation frequency and temperature. These properties are reversible and repeatable with either frequency or temperature cycling.

In addition, Figure 23 shows the permanent decay of the piezoelectric strain constant d_{33} for PVDF, annealed at 70°C, after long term exposure to elevated temperatures.

Figure 23. Thermal stability of d_{33} constant - PVDF



Having reached a stabilizing temperature, the material properties then remain constant with time. Piezo film can be annealed to specific operating (or maximum storage) temperatures to achieve long-term stability for high temperature applications. Figure 24 shows the reversible temperature effects on d_{33} and g_{31} coefficients for PVDF.

In Figures 25a and 25b, the effect of temperature on the dielectric constant ($\varepsilon/\varepsilon_O$) and dissipation factor (tan $\delta_{e)}$ are shown for copolymer films.

Piezo films have been shown to offer excellent transducer properties at very low (cryogenic) temperatures.

Figure 24. Temperature coefficient for d_{33} and g_{31} constants - PVDF

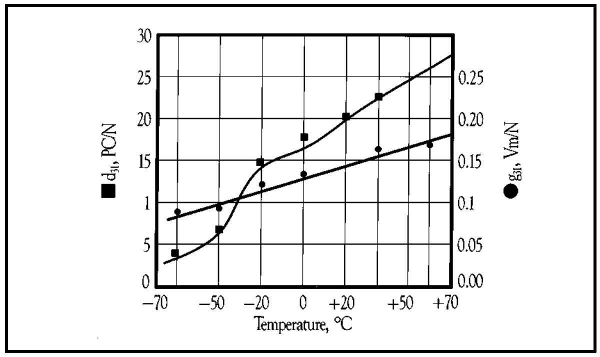


Figure 25a. Dielectric loss tangent vs. temperature

COPOLYMER

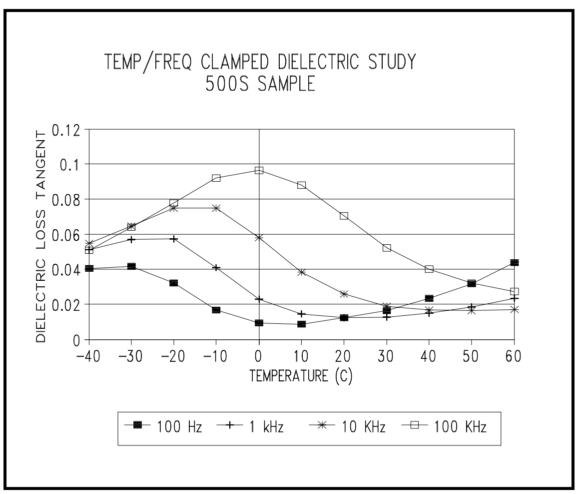


Figure 25b. Dielectric constant vs. temperature

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