

Electrical Properties for RADEL[®] R Polyphenylsulfone

Using thermoplastic resins for many applications depends on their ability to function as electrical insulators. Following are several tests that have been developed to provide the designer with measures of how well a particular resin can perform that function. Table 1 shows typical properties for RADEL[®] R polyphenylsulfone for each of these tests.

Dielectric Strength

Dielectric strength is a measure of a material's ability to resist high voltage without dielectric breakdown. It is measured by placing a specimen between electrodes and increasing the applied voltage through a series of steps until dielectric breakdown occurs. Although the results have units of volts/mil (kV/mm), they are not independent of sample thickness; therefore, data on different materials are comparable only for equivalent sample thicknesses.

Volume Resistivity

Volume resistivity is defined as the resistance of a unit cube of material. The test is run by subjecting the material to 500 volts for one minute and measuring the current. The higher the volume resistivity, the more effective a material will be in electrically isolating components.

Dielectric Constant

Dielectric constant is defined as the ratio of the capacitance of a condenser using the test material as the dielectric to the capacitance of the same condenser with a vacuum replacing the dielectric.

Insulating materials are used in two very distinct ways: 1) to support and insulate components from each other and ground and 2) to function as a capacitor dielectric. In the first case, it is desirable to have a low dielectric constant. In the second case, a high dielectric constant allows the capacitor to be physically smaller.

Dissipation Factor

Dissipation factor (also referred to as loss tangent or tan d) is a measure of the dielectric loss (energy dissipated) of alternating current to heat. In general, low dissipation factors are desirable.

Table 1

Electrical properties of RADEL R polyphenylsulfone tested at 0.125 in (3.2 mm) at 73°F (23°C)

	Typical Properties	ASTM Test Method
Dielectric strength, kV/mm	15	D-149
Volume resistivity, ohm-cm	9x10 ¹⁵	D-257
Dielectric constant		
at 60 Hz	3.44	D-150
at10 ³ Hz	3.45	D-150
at10 ⁶ Hz	3.45	D-150
Dissipation factor		
at 60 Hz	0.0006	D-150
at10 ⁶ Hz	0.0076	D-150

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