PPE+PS alloy (impact modified)

General information

Designation

Polyphenylene ether (PPE) [polyphenylene oxide (PPO)] + polystyrene alloy (impact modified) blend

Tradenames

Diamar; Luranyl; Noryl; Vestoran; Xyron

Typical uses

Electrical fittings; TV components; Washing Machine components; car fascia panels; Calculator cases; VDU housings

Composition overview

Compositional summary

Miscible blend of: Polyphenylene Ether (PPE) [Polyphenylene Oxide (PPO)] [(poly 2,6-dimethylphenylene ether, (C6H2(CH3)2O)n)] + Polystryrene (PS) or a High-Impact Polystryrene (PS-HI, SB). 50:50 mixture results in a Tg of about 150 deg C. More PPO raises Tg, more PS lowers Tg.

Material family	Plastic (thermoplastic, amorphous)
Base material	PPE+PS (Polyphenylene ether + polystyrene blend)
Additive	Impact modifier
Polymer code	(PPE+PS)-I

Composition detail (polymers and natural materials)

Polymer		85	-	95	%
Impact modifier		5	-	15	%

Price

Price	*	1.68	-	2.3	USD/lb

Physical properties

Density		0.0459	-	0.0491	lb/in^3

Mechanical properties

Young's modulus		0.345	-	0.36	10^6 psi
Yield strength (elastic limit)	*	5.6	-	6.4	ksi
Tensile strength		7.01	-	8.01	ksi
Elongation		32.6	-	37.6	% strain
Compressive modulus	*	0.345	-	0.36	10^6 psi
Compressive strength	*	9.53	-	10.5	ksi
Flexural modulus		0.323	-	0.344	10^6 psi
Flexural strength (modulus of rupture)		8.19	-	11	ksi
Shear modulus	*	0.123	-	0.129	10^6 psi
Bulk modulus	*	0.565	-	0.593	10^6 psi
Poisson's ratio	*	0.391	-	0.406	
Shape factor		5.8			
Hardness - Vickers	*	11.6	-	13.2	HV
Hardness - Rockwell M		88.6	-	97.7	
Hardness - Rockwell R	*	117	-	128	
Fatigue strength at 10^7 cycles	*	2.63	-	3.42	ksi
Mechanical loss coefficient (tan delta)	*	0.0161	-	0.0168	

Impact & fracture properties

Fracture toughness	*	1.32	-	3.96	ksi.in^0.5
Impact strength, notched 23 °C		0.0208	-	0.0232	BTU/in^2

Thermal properties

Glass temperature		261	-	289	°F
Heat deflection temperature 0.45MPa		205	-	244	°F
Heat deflection temperature 1.8MPa		190	-	244	°F
Maximum service temperature	*	174	-	201	°F
Minimum service temperature		-67	-	-49	°F
Thermal conductivity	*	0.158	-	0.164	BTU.ft/hr.ft^2.°F
Specific heat capacity	*	0.344	-	0.358	BTU/lb.°F
Thermal expansion coefficient	*	60	-	61.2	µstrain/°F

Electrical properties

Electrical resistivity	*	3.3e20	-	3e21	µohm.cm
Dielectric constant (relative permittivity)	*	4.01	-	4.42	
Dissipation factor (dielectric loss tangent)	*	0.0121	-	0.0146	
Dielectric strength (dielectric breakdown)		511	-	551	V/mil
Comparative tracking index		150	-	225	V

Optical properties

Transparency	Transparent

Magnetic properties

Magnetic type	Non-magnetic

Bio-data

RoHS (EU) compliant grades?	✓
Food contact	Yes

Absorption & permeability

Water absorption @ 24 hrs		0.07	-	0.1	%

Processing properties

Polymer injection molding		Acceptable			
Polymer extrusion		Acceptable			
Polymer thermoforming		Unsuitable			
Linear mold shrinkage		0.545	-	0.66	%
Melt temperature		352	-	550	°F
Molding pressure range		9.98	-	14.9	ksi

Durability

Water (fresh)	Excellent
Water (salt)	Excellent
Weak acids	Excellent
Strong acids	Acceptable
Weak alkalis	Excellent
Strong alkalis	Acceptable
Organic solvents	Limited use
Oxidation at 500C	Unacceptable
UV radiation (sunlight)	Fair
Flammability	Highly flammable

Primary production energy, CO2 and water

Embodied energy, primary production	*	5.07e4	-	5.59e4	BTU/lb
CO2 footprint, primary production	*	5.78	-	6.38	lb/lb
NOx creation	*	0.017	-	0.0188	lb/lb
SOx creation	*	0.0509	-	0.0563	lb/lb

Water usage	* 7.09e3	-	7.83e3	in^3/lb

Processing energy, CO2 footprint & water

Polymer extrusion energy	* 2.51e3	-	2.77e3	BTU/lb
Polymer extrusion CO2	* 0.437	-	0.483	lb/lb
Polymer extrusion water	* 134	-	200	in^3/lb
Polymer molding energy	* 8.09e3	-	8.94e3	BTU/lb
Polymer molding CO2	* 1.41	-	1.56	lb/lb
Polymer molding water	* 350	-	525	in^3/lb
Coarse machining energy (per unit wt removed)	* 419	-	463	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.073	-	0.0807	lb/lb
Fine machining energy (per unit wt removed)	* 2.35e3	-	2.59e3	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.41	-	0.453	lb/lb
Grinding energy (per unit wt removed)	* 4.49e3	-	4.96e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.783	-	0.866	lb/lb

Recycling and end of life

Recycle	✓			
Embodied energy, recycling	* 1.72e4	-	1.9e4	BTU/lb
CO2 footprint, recycling	* 1.96	-	2.17	lb/lb
Recycle fraction in current supply	0.1			%
Downcycle	✓			
Combust for energy recovery	✓			
Heat of combustion (net)	* 1.47e4	-	1.62e4	BTU/lb
Combustion CO2	* 2.97	-	3.12	lb/lb
Landfill	✓			
Biodegrade	✗			

Notes

Other notes

Also known as: PPE, polyphenylene ether

Links

ProcessUniverse

Producers

Reference

Shape