

General information

Designation

Polyphenylene Sulfide (Unfilled)

Tradenames

Celstran, China, Coolpoly, Durafide, Electrafil, Fortron, Freqtis, Hifill, Infino, Luvocom, Nemcon, Ryton, Tedur, Therma-Tech, Torelina, Tripps

Typical uses

Electrical components; chemical pumps; under-bonnet components; coatings for chemical and/or abrasion resistance.

Composition overview

Compositional summary

(S-(C₆H₄))_n

| | |
|-----------------|---|
| Material family | Plastic (thermoplastic, semi-crystalline) |
| Base material | PPS (Polyphenylene sulfide) |
| Polymer code | PPS |

Composition detail (polymers and natural materials)

| | | |
|---------|-----|---|
| Polymer | 100 | % |
|---------|-----|---|

Price

| | | | |
|-----------------------|--------|--------|---------------------|
| Price | * 2.89 | - 3.13 | USD/lb |
| Price per unit volume | * 242 | - 266 | USD/ft ³ |

Physical properties

| | | | |
|---------|--------|----------|--------------------|
| Density | 0.0484 | - 0.0491 | lb/in ³ |
|---------|--------|----------|--------------------|

Mechanical properties

| | | | |
|--|---------|---------|---------------------|
| Young's modulus | 0.468 | - 0.492 | 10 ⁶ psi |
| Yield strength (elastic limit) | 9.28 | - 9.75 | ksi |
| Tensile strength | 7.01 | - 12.5 | ksi |
| Elongation | 1 | - 6 | % strain |
| Compressive modulus | * 0.468 | - 0.492 | 10 ⁶ psi |
| Compressive strength | * 15.2 | - 16.8 | ksi |
| Flexural modulus | 0.548 | - 0.599 | 10 ⁶ psi |
| Flexural strength (modulus of rupture) | * 9.81 | - 17.5 | ksi |
| Shear modulus | * 0.169 | - 0.177 | 10 ⁶ psi |
| Bulk modulus | * 0.709 | - 0.745 | 10 ⁶ psi |
| Poisson's ratio | * 0.382 | - 0.398 | |
| Shape factor | 5.3 | | |

| | | | | |
|--|----------|---|--------|-----|
| Hardness - Vickers | * 12 | - | 21 | HV |
| Hardness - Rockwell R | 118 | - | 130 | |
| Fatigue strength at 10 ⁷ cycles | * 2.8 | - | 5 | ksi |
| Mechanical loss coefficient (tan delta) | * 0.0118 | - | 0.0124 | |

Impact & fracture properties

| | | | | |
|----------------------------------|---------|---|---------|-----------------------|
| Fracture toughness | * 1.11 | - | 1.59 | ksi.in ^{0.5} |
| Impact strength, notched 23 °C | 7.95e-4 | - | 0.00159 | BTU/in ² |
| Impact strength, unnotched 23 °C | 0.015 | - | 0.0182 | BTU/in ² |

Thermal properties

| | | | | |
|-------------------------------------|---------|---|-------|-------------------------------|
| Melting point | 545 | - | 554 | °F |
| Glass temperature | 178 | - | 207 | °F |
| Heat deflection temperature 0.45MPa | 349 | - | 432 | °F |
| Heat deflection temperature 1.8MPa | 212 | - | 275 | °F |
| Maximum service temperature | 482 | - | 520 | °F |
| Minimum service temperature | * -67 | - | -31 | °F |
| Thermal conductivity | 0.133 | - | 0.168 | BTU.ft/hr.ft ² .°F |
| Specific heat capacity | * 0.338 | - | 0.351 | BTU/lb.°F |
| Thermal expansion coefficient | 27 | - | 49 | µstrain/°F |

Electrical properties

| | | | | |
|--|--------|---|---------|---------|
| Electrical resistivity | 1.3e21 | - | 1.18e22 | µohm.in |
| Dielectric constant (relative permittivity) | 3 | - | 3.2 | |
| Dissipation factor (dielectric loss tangent) | 3.8e-4 | - | 4.2e-4 | |
| Dielectric strength (dielectric breakdown) | 381 | - | 450 | V/mil |
| Comparative tracking index | 100 | - | 250 | V |

Magnetic properties

| | | | | |
|---------------|--------------|--|--|--|
| Magnetic type | Non-magnetic | | | |
|---------------|--------------|--|--|--|

Optical properties

| | | | | |
|--------------|--------|--|--|--|
| Transparency | Opaque | | | |
|--------------|--------|--|--|--|

Critical materials risk

| | | | | |
|-----------------------------------|----|--|--|--|
| Contains >5wt% critical elements? | No | | | |
|-----------------------------------|----|--|--|--|

Absorption & permeability

| | | | | |
|--------------------------------|---------|---|---------|----------------------------|
| Water absorption @ 24 hrs | 0.01 | - | 0.07 | % |
| Water vapor transmission | 3.83e-6 | - | 7.17e-6 | lb.in/ft ² .day |
| Permeability (O ₂) | 5.98e-8 | - | 9.03e-8 | ft ² /day.atm |

Processing properties

| | |
|---------------------------|--------------|
| Polymer injection molding | Limited use |
| Polymer extrusion | Limited use |
| Polymer thermoforming | Limited use |
| Linear mold shrinkage | 0.6 - 1.4 % |
| Melt temperature | 495 - 640 °F |
| Mold temperature | 275 - 311 °F |
| Molding pressure range | 2 - 2.99 ksi |

Durability

| | |
|-------------------------|--------------------|
| Water (fresh) | Excellent |
| Water (salt) | Excellent |
| Weak acids | Excellent |
| Strong acids | Acceptable |
| Weak alkalis | Excellent |
| Strong alkalis | Excellent |
| Organic solvents | Acceptable |
| Oxidation at 500C | Unacceptable |
| UV radiation (sunlight) | Good |
| Flammability | Self-extinguishing |

Primary production energy, CO2 and water

| | |
|-------------------------------------|--------------------------|
| Embodied energy, primary production | * 9.2e4 - 1.01e5 BTU/lb |
| CO2 footprint, primary production | * 11.6 - 12.8 lb/lb |
| Water usage | * 1.45e3 - 1.6e3 in^3/lb |

Processing energy, CO2 footprint & water

| | |
|---|--------------------------|
| Polymer extrusion energy | * 2.56e3 - 2.83e3 BTU/lb |
| Polymer extrusion CO2 | * 0.446 - 0.493 lb/lb |
| Polymer extrusion water | * 135 - 203 in^3/lb |
| Polymer molding energy | * 9.59e3 - 1.06e4 BTU/lb |
| Polymer molding CO2 | * 1.67 - 1.85 lb/lb |
| Polymer molding water | * 390 - 585 in^3/lb |
| Coarse machining energy (per unit wt removed) | * 538 - 595 BTU/lb |
| Coarse machining CO2 (per unit wt removed) | * 0.0939 - 0.104 lb/lb |
| Fine machining energy (per unit wt removed) | * 3.54e3 - 3.92e3 BTU/lb |
| Fine machining CO2 (per unit wt removed) | * 0.618 - 0.683 lb/lb |
| Grinding energy (per unit wt removed) | * 6.88e3 - 7.61e3 BTU/lb |
| Grinding CO2 (per unit wt removed) | * 1.2 - 1.33 lb/lb |

Recycling and end of life

| | | | | |
|------------------------------------|----------|---|--------|--------|
| Recycle | ✓ | | | |
| Embodied energy, recycling | * 3.12e4 | - | 3.45e4 | BTU/lb |
| CO2 footprint, recycling | * 3.94 | - | 4.35 | lb/lb |
| Recycle fraction in current supply | 0.1 | | | % |
| Downcycle | ✓ | | | |
| Combust for energy recovery | ✓ | | | |
| Heat of combustion (net) | * 1.19e4 | - | 1.25e4 | BTU/lb |
| Combustion CO2 | * 2.38 | - | 2.5 | lb/lb |
| Landfill | ✓ | | | |
| Biodegrade | ✗ | | | |

Links

ProcessUniverse

Producers

Reference

Shape