

Description

The material

PC is one of the 'engineering' thermoplastics, meaning that they have better mechanical properties than the cheaper 'commodity' polymers. The family includes the plastics polyamide (PA), polyoxymethylene (POM) and polytetrafluorethylene (PTFE). The benzene ring and the -OCOO- carbonate group combine in pure PC to give it its unique characteristics of optical transparency and good toughness and rigidity, even at relatively high temperatures. These properties make PC a good choice for applications such as compact disks, safety hard hats and housings for power tools. To enhance the properties of PC even further, it is possible to co-polymerize the molecule with other monomers (improves the flame retardancy, refractive index and resistance to softening), or to reinforce the PC with glass fibers (giving better mechanical properties at high temperatures).

Composition

$(O-(C_6H_4)-C(CH_3)_2-(C_6H_4)-CO)_n$

Image



Caption

Polycarbonate is tough and impact-resistant: hence its use in hard hats and helmets, transparent roofing and riot shields.

General properties

Density	1140	-	1210	kg/m ³
Price	3.007	-	3.536	EUR/kg

Mechanical properties

Young's modulus	2	-	2.44	GPa
Yield strength (elastic limit)	59	-	70	MPa
Tensile strength	60	-	72.4	MPa
Elongation	70	-	150	%
Hardness - Vickers	17.7	-	21.7	HV
Fatigue strength at 10 ⁷ cycles	22.14	-	30.81	MPa
Fracture toughness	2.1	-	4.602	MPa.m ^{1/2}

Thermal properties

Thermal conductor or insulator?

Good insulator

Thermal conductivity

0.189 - 0.218 W/m.K

Thermal expansion coefficient

120.1 - 136.8 $\mu\text{strain}/^\circ\text{C}$

Specific heat

1535 - 1634 J/kg.K

Maximum service temperature

100.9 - 143.9 $^\circ\text{C}$

Electrical properties

Electrical conductor or insulator?

Good insulator

Optical properties

Transparency

Optical Quality

Eco properties

Embodied energy

105 - 116 MJ/kg

CO2 footprint

3.8 - 4.2 kg/kg

Recycle



Recycle mark

Other less
common
polymers



Supporting information

Typical uses

Safety shields and goggles; lenses; glazing panels; business machine housing; instrument casings; lighting fittings; safety helmets; electrical switchgear; laminated sheet for bullet-proof glazing; twin-walled sheets for glazing; kitchenware and tableware; microwave cookware, medical (sterilizable) components.

Links

Reference

ProcessUniverse

Producers