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Polymers - Physical Properties

Densities, tensile strength, elongation, Youngs modulus and Brinell hardness.

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Physical properties of some common plastic materials are indicated below.

Thermoplastics

Thermoplastics can be softened as often as they are reheated and are not so rigid as thermosetting plastics but tend to be rougher.

Polymers - Physical Properties

Polymer	Density - ρ - (kg/m^3) (lb/ft^3)	Tensile Strength - σ - (MPa)	Elongation (%)	Young's Modulus - E - (GPa)	Brinell Hardness Number
ABS					
Acrylic (metacrylate)	1190	74	6	3.0	34
Cellulose Acetate	1300	40	10 - 60	1.4	12
Cellulose Nitrate	1350	48	40	1.4	10
Nylon	1160	60	90	2.4	10
Polyethylene	950	20 - 30	20 - 100	0.7	2
Polycarbonate					
Polyetherimide					
Polyethylene					

Polymer	Density - ρ - (kg/m ³)	Tensile Strength - σ - (MPa)	Elongation (%)	Young's Modulus - E - (GPa)	Brinell Hardness Number
Polyimide					
Polypropylene	900	27	200 - 700	1.3	10
Polystyrene	1050	48	3	3.4	25
PTFE (fluoropolymer)	2100	13	100	0.3	
PVC	1330	48	200	3.4	20

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Thermosets (Thermosetting Plastics)

Thermosetting plastics undergo a chemical change during moulding and can never again be softened by reheating. The chemical change in the moulding process is triggered by temperature and pressure and is called *curing*.

Thermosetting plastics are harder and more brittle than thermoplastic materials.

Polymers - Physical Properties

Polymer	Density - ρ - (kg/m ³) (lb/ft ³)	Tensile Strength - σ - (MPa)	Elongation (%)	Young's Modulus - E - (GPa)	Brinell Hardness Number
Acetals, glass filled	1600	58 - 75	2 - 7	7	27
Allyl					
Epoxy resin, glass filled	1600 - 2000	68 - 200	4	20	38
Melamine formaldehyde, fabric filled	1800 - 2000	60 - 90		7	38
Phenol formaldehyde,	1600 - 1900	38 - 50	0.5	17 - 35	36



Polyurethane					
Silicone					
Urea formaldehyde, cellulose filled	1500	38 - 90	1	7 - 10	51

- $1 \text{ MPa} = 0.1 \text{ GPa} = 1 \text{ N/mm}^2$
- $1 \text{ N/m}^2 = 1 \text{ Pa} = 10^{-6} \text{ N/mm}^2 = 1.4504 \times 10^{-4} \text{ psi}$

Elastomers

Elastomers are substances such as natural rubber and polymers which have material properties which resemble rubber.

- Butyl
- Chloroprene, neoprene
- Ethylene–propylene
- Fluorinated copolymers
- Isoprene
- Natural rubber
- Nitrile, Buna N
- Polysulfide
- Polyurethane
- PVC
- Silicone copolymers

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Related Topics

Material Properties



- **Malleability vs. Brittleness vs. Ductility**

Plastic deformation properties.

- **Modulus of Rigidity**

Shear Modulus (Modulus of Rigidity) is the elasticity coefficient for shearing or torsion force.

- **Plastics - Abbreviations**

Commonly used plastic abbreviations.

- **Plastics - Recycling Codes and Labeling**

Symbol codes and labeling used for recycling plastic products like bottles, containers and packaging.

- **Plastics - Thermal Conductivity Coefficients**

Thermal conductivity of plastics.

- **Polymers - Specific Heats**

Specific heat of polymers like epoxy, PET, polycarbonate and more.

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Unit Converter

Temperature

0.0

☒ °C

☐ K

☐ °F

Convert!



- ☐ *in*
- ☐ *ft*
- ☐ *yards*
- ☐ *miles*
- ☐ *naut miles*

Convert!

Area

1.0

- ☒ m^2
- ☐ km^2
- ☐ in^2
- ☐ ft^2
- ☐ $miles^2$
- ☐ *acres*

Convert!

Volume

1.0

- ☒ m^3
- ☐ *liters*
- ☐ in^3
- ☐ ft^3
- ☐ *us gal*

Convert!

Weight

1.0

- ☒ kg_f
- ☐ *N*
- ☐ *lbf*

Convert!



- ☐ *ft/min*
☐ *ft/s*
☐ *mph*
☐ *knots*

Convert!

Pressure

1.0

- ☒ *Pa*
☐ *bar*
☐ *mm H₂O*
☐ *kg/cm²*
☐ *psi*
☐ *inches H₂O*

Convert!

Flow

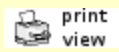
1.0

- ☒ *m³/s*
☐ *m³/h*
☐ *US gpm*
☐ *cfm*

Convert!

4.26.8

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