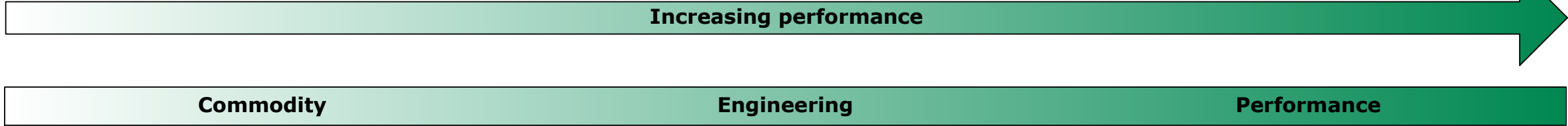


The Periodic Table of the elements by Mendeleev was a historic achievement in chemistry and enabled chemists to see the relationship between structure and properties of the basic elements.  
 Polymers also have a strong relationship between structure and properties and this 'Periodic Table of Polymers' is a first attempt to provide a simple codification of the basic polymer types and structures.  
 The diversity of polymer types makes it impossible to include all of the variations in one simple table and this table only includes the most common polymers.

# Tangram Technology Periodic Table of Thermoplastics

**KEY**  
**TS** = Tensile Strength at Yield @ 23°C  
**EAB** = Elongation at break  
**TM** = Tensile Modulus @ 23°C  
**LTST** = Long Term Service Temperature  
**HDT** = Heat Deflection Temperature @ 1.8 MPa  
**Cost** = Relative Cost

All properties are for the natural injection moulding grade resin only and do not include polymers with reinforcements or other functional fillers.



**Amorphous**

Random molecular orientation in both molten and solid phases.

**General Characteristics**  
 Soften gradually. Generally transparent. Lower Tensile Strength and Tensile Modulus. Lower Density. Low Creep Resistance. High Dimensional Stability. Low fatigue resistance. Easy to bond using adhesives and solvents (high surface energy).

**Semicrystalline**

Random molecular orientation in molten phase, densely packed crystallites in solid phase.

**General Characteristics**  
 Sharp melting point. Generally translucent or opaque. Higher Tensile Strength and Tensile Modulus. Higher Density. High Creep Resistance. Low Dimensional Stability. High fatigue resistance. Difficult to bond using adhesives and solvents (low surface energy).

Commodity	Engineering	Performance																																	
<table border="1"> <tr> <td><b>PS-HI</b> High Impact Polystyrene TS: 19 - 33 MPa EAB: 40 - 50% TM: 1.8 GPa LTST: 55 - 60°C HDT = 60 - 80°C Cost: ♦</td> <td><b>PS-GP</b> General Purpose Polystyrene TS: 40 - 50 MPa EAB: &lt; 3% TM: 3.2 - 3.5 GPa LTST: 70 - 85°C HDT: 72 - 82°C Cost: ♦</td> <td><b>ABS</b> Acrylonitrile Butadiene Styrene (Copolymer) TS: 40 - 60 MPa EAB: 3 - 20% TM: 2.0 - 2.6 GPa LTST: 80 - 95°C HDT = 90 - 100°C Cost: ♦</td> <td><b>SAN</b> Styrene Acrylonitrile (Copolymer) TS: 47 - 72 MPa EAB: 2.0 - 10% TM: 2.3 - 4.1 GPa LTST: 55 - 60°C HDT = 84 - 95°C Cost: ♦♦</td> </tr> <tr> <td><b>PVC-P</b> Plasticised Polyvinylchloride TS: 6 - 20 MPa EAB: 50 - 400% TM: 0.002 - 0.020 GPa LTST: 50°C HDT: 20°C Cost: ♦</td> <td><b>SBS</b> Styrene-Butadiene-Styrene (Copolymer) TS: 35 - 40 MPa EAB: 40% TM: 1.8 - 2.0 GPa LTST: 60°C HDT = 67°C Cost: ♦♦</td> <td><b>SMA</b> Styrene-Maleic Anhydride (Copolymer) TS: 40 - 52 MPa EAB: 1.8% TM: 2.0 GPa LTST: 100°C HDT = 105°C Cost: ♦♦</td> <td><b>ASA</b> Acrylonitrile Styrene Acrylate (Copolymer) TS: 38 - 70 MPa EAB: 15 - 45% TM: 2.3 - 2.9 GPa LTST: 82 - 120°C HDT = 82 - 120°C Cost: ♦♦</td> </tr> <tr> <td><b>PVC-U</b> Unplasticised Polyvinylchloride TS: 45 - 55 MPa EAB: 25 - 60% TM: 2.50 - 3.02 GPa LTST: 60 - 70°C HDT: 64 - 70°C Cost: ♦</td> <td><b>CA</b> Cellulose Acetate TS: 30 - 55 MPa EAB: 5 - 55% TM: 1.6 GPa LTST: 45 - 70°C HDT: 48 - 65°C Cost: ♦♦</td> <td><b>CAB</b> Cellulose Acetate Butyrate TS: 26 - 60 MPa EAB: 8 - 80% TM: 0.7 - 1.5 GPa LTST: 75 - 100°C HDT: 62 - 70°C Cost: ♦♦</td> <td><b>CAP</b> Cellulose Acetate Propionate TS: 26 - 47 MPa EAB: 30 - 100% TM: 0.7 - 1.5 GPa LTST: 75 - 100°C HDT: 45 - 75°C Cost: ♦♦</td> </tr> <tr> <td><b>PVC-U</b> High-Impact Unplasticised PVC TS: 45 - 55 MPa EAB: 25 - 60% TM: 2.5 - 3.0 GPa LTST: 60 - 70°C HDT: 64 - 70°C Cost: ♦</td> <td></td> <td></td> <td></td> </tr> </table>	<b>PS-HI</b> High Impact Polystyrene TS: 19 - 33 MPa EAB: 40 - 50% TM: 1.8 GPa LTST: 55 - 60°C HDT = 60 - 80°C Cost: ♦	<b>PS-GP</b> General Purpose Polystyrene TS: 40 - 50 MPa EAB: < 3% TM: 3.2 - 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47 MPa EAB: 150% TM: 2.5 - 3.0 GPa LTST: 70 - 95°C HDT: 120°C Cost: ♦♦♦</td> <td><b>PVC-C</b> Chlorinated Polyvinylchloride TS: 53 - 58 MPa EAB: 25 - 45% TM: 2.6 - 2.7 GPa LTST: 90 - 110°C HDT: 105°C Cost: ♦♦♦</td> </tr> </table>	<b>PMMA</b> Polymethylmethacrylate (Acrylic) TS: 56 - 70 MPa EAB: 3.0 - 3.5% TM: 3.0 GPa LTST: 90°C HDT = 85 - 95°C Cost: ♦♦♦	<b>PPO (Modified)</b> Polyphenylene Oxide TS: 40 - 90 MPa EAB: 10 - 60% TM: 2.0 - 5.4 GPa LTST: 80 - 260°C HDT = 129°C Cost: ♦♦	<b>PC</b> Polycarbonate TS: 55 - 75 MPa EAB: 110 - 120% TM: 1.6 - 2.4 GPa LTST: 95 - 154°C HDT = 135 - 140°C Cost: ♦♦	<b>PET-G</b> Glycolised Polyethylene terephthalate TS: 55 MPa EAB: 300% TM: GPa LTST: 60°C HDT: 70°C Cost: ♦♦♦	<b>PVC-UX</b> Crosslinked Unplasticised PVC TS: 26 - 47 MPa EAB: 150% TM: 2.5 - 3.0 GPa LTST: 70 - 95°C HDT: 120°C Cost: ♦♦♦	<b>PVC-C</b> Chlorinated Polyvinylchloride TS: 53 - 58 MPa EAB: 25 - 45% TM: 2.6 - 2.7 GPa LTST: 90 - 110°C HDT: 105°C Cost: ♦♦♦	<table border="1"> <tr> <td><b>PAR</b> Polyarylate TS: 68 - 71 MPa EAB: 50 - 100% TM: 2.0 - 2.2 GPa LTST: 130 - 150°C HDT = 165 - 175°C Cost: ♦♦♦</td> <td><b>PSU</b> Polysulphone TS: 70 - 76 MPa EAB: 10 - 80% TM: 1.5 - 2.7 GPa LTST: 150 - 180°C HDT = 160 - 174°C Cost: ♦♦♦</td> <td><b>PES</b> Polyethersulphone TS: 70 - 95 MPa EAB: 40 - 80% TM: 2.4 - 2.6 GPa LTST: 180 - 220°C HDT = 200 - 210°C Cost: ♦♦♦</td> <td><b>PPSU</b> Polyethersulphone (Block copolymer) TS: 83 MPa EAB: 40 - 80% TM: 2.65 GPa LTST: 180°C HDT = 204°C Cost: ♦♦♦♦</td> </tr> <tr> <td><b>PEI</b> Polyetherimide TS: 100 - 105 MPa EAB: 40 - 60% TM: 2.7 - 4.5 GPa LTST: 170 - 215°C HDT = 200 - 215°C Cost: ♦♦♦♦</td> <td><b>PAI</b> Polyamideimide TS: 90 - 150 MPa EAB: 2.6 - 12% TM: 2.5 - 8.9 GPa LTST: 220 - 280°C HDT = 275 - 280°C Cost: ♦♦♦♦♦</td> <td><b>PI</b> Polyimide TS: 72 - 90 MPa EAB: 6 - 8% TM: 1.3 - 4 GPa LTST: 260 - 300°C HDT = 280 - 360°C Cost: ♦♦♦♦♦</td> <td><b>PBI</b> Polybenzimidazole TS: 120 - 160 MPa EAB: 2.6 - 3.0% TM: 4.0 - 6.5 GPa LTST: 260 - 400°C HDT = 220°C Cost: ♦♦♦♦♦</td> </tr> <tr> <td><b>PA 6/3T</b> Amorphous polyamide TS: 60 - 100 MPa EAB: &gt; 50% TM: 1.4 - 2.3 GPa LTST: 125°C HDT = 102 - 123°C Cost: ♦♦♦</td> <td><b>PPA</b> Polyphthalamide (Amorphous) TS: 85 MPa EAB: 2.6% TM: 3.7 GPa LTST: 140°C HDT = 138°C Cost: ♦♦♦♦</td> <td><b>PARA</b> Polyaryl amide TS: 60 MPa EAB: 100% TM: 24 GPa LTST: 150°C HDT = 150°C Cost: ♦♦♦♦</td> </tr> </table>	<b>PAR</b> Polyarylate TS: 68 - 71 MPa EAB: 50 - 100% TM: 2.0 - 2.2 GPa LTST: 130 - 150°C HDT = 165 - 175°C Cost: ♦♦♦	<b>PSU</b> Polysulphone TS: 70 - 76 MPa EAB: 10 - 80% TM: 1.5 - 2.7 GPa LTST: 150 - 180°C HDT = 160 - 174°C Cost: ♦♦♦	<b>PES</b> Polyethersulphone TS: 70 - 95 MPa EAB: 40 - 80% TM: 2.4 - 2.6 GPa LTST: 180 - 220°C HDT = 200 - 210°C Cost: ♦♦♦	<b>PPSU</b> Polyethersulphone (Block copolymer) TS: 83 MPa EAB: 40 - 80% TM: 2.65 GPa LTST: 180°C HDT = 204°C Cost: ♦♦♦♦	<b>PEI</b> Polyetherimide TS: 100 - 105 MPa EAB: 40 - 60% TM: 2.7 - 4.5 GPa LTST: 170 - 215°C HDT = 200 - 215°C Cost: ♦♦♦♦	<b>PAI</b> Polyamideimide TS: 90 - 150 MPa EAB: 2.6 - 12% TM: 2.5 - 8.9 GPa LTST: 220 - 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<table border="1"> <tr> <td><b>PE-LD</b> Low Density Polyethylene TS: 7.0 - 25 MPa EAB: 50 - 400% TM: 0.15 - 0.35 GPa LTST: 40 - 70°C HDT = 35°C Cost: ♦</td> <td><b>PE-LLD</b> Linear Low Density Polyethylene TS: 8.0 - 20 MPa EAB: 50 - 500% TM: 0.2 - 1.0 GPa LTST: 44 - 50°C HDT = 37 - 44°C Cost: ♦</td> <td><b>PE-MD</b> Medium Density Polyethylene TS: 14 - 25 MPa EAB: 50 - 300% TM: 0.25 - 0.70 GPa LTST: 38 - 70°C HDT = 38 - 43°C Cost: ♦♦</td> <td><b>PMP</b> Polymethyl pentene TS: 25 - 28 MPa EAB: 15 - 30% TM: 1.0 - 2.2 GPa LTST: 55 - 60°C HDT = 40 - 50°C Cost: ♦♦♦</td> <td><b>EVA</b> Ethylene-vinyl Acetate (12% VA) TS: 10 - 19 MPa EAB: 50 - 750% TM: 0.04 - 0.14 GPa LTST: 50°C HDT = 20 - 23°C Cost: ♦♦♦</td> </tr> <tr> <td><b>PE-HD</b> High Density Polyethylene TS: 10 - 50 MPa EAB: 400 - 800% TM: 0.18 - 1.6 GPa LTST: 55°C HDT = 46°C Cost: ♦</td> <td><b>PP</b> Polypropylene (Homopolymer) TS: 33 MPa EAB: 150% TM: 1.5 GPa LTST: 100°C HDT = 65°C Cost: ♦</td> <td><b>PP</b> Polypropylene (Copolymer) TS: 25 MPa EAB: 300% TM: 1.2 GPa LTST: 90°C HDT = 60°C Cost: ♦</td> <td><b>PE-Chlorinated</b> Chlorinated Polyethylene TS: 12.5 MPa EAB: 700% TM: 0.002 GPa LTST: 60°C HDT = 25°C Cost: ♦♦♦</td> <td><b>PE-VLD</b> Very Low Density Polyethylene TS: 34 - 400 MPa EAB: 400 - 700% TM: 0.10 - 0.20 GPa LTST: 60°C HDT = 75 - 95°C Cost: ♦♦♦</td> </tr> <tr> <td></td> <td><b>EMA</b> Ethylene-methyl Acrylate TS: 9 - 12 MPa EAB: 750 - 800% TM: 0.03 GPa LTST: 55°C HDT = 59°C Cost: ♦♦♦</td> <td><b>PBT</b> Polybutylene-terephthalate TS: 30 - 105 MPa EAB: 250% TM: 1.5 - 5.2 GPa LTST: 65 - 120°C HDT: 70°C Cost: ♦♦</td> <td><b>PET</b> Crystalline Polyethylene-terephthalate TS: 57 - 75 MPa EAB: 50 - 200% TM: 2.47 - 3.0 GPa LTST: 63 - 100°C HDT: 83 - 100°C Cost: ♦♦</td> <td><b>PA 6/10</b> Polyamide 6/10 (Nylon 6/10) TS: 50 - 60 MPa EAB: 70 - 150% TM: 1.5 - 2.8 GPa LTST: 60 - 110°C HDT = 65 - 85°C Cost: ♦♦♦</td> </tr> <tr> <td></td> <td><b>PA 6/6</b> Polyamide 6/6 (Nylon 6/6) TS: 40 - 86 MPa EAB: 150 - 250% TM: 1.2 - 2.8 GPa LTST: 80 - 120°C HDT = 60 - 90°C Cost: ♦♦</td> <td><b>PA 6/6</b> Polyamide 6/6 (Nylon 6/6) TS: 40 - 86 MPa EAB: 4.8 - 300% TM: 0.7 - 5.5 GPa LTST: 60 - 200°C HDT = 50 - 150°C Cost: ♦♦♦</td> <td><b>PA 6/12</b> Polyamide 6/12 (Nylon 6/12) TS: 17 - 60 MPa EAB: 4 - 600% TM: 0.29 - 5.5 GPa LTST: 42 - 190°C HDT = 50 - 90°C Cost: ♦♦♦</td> <td><b>POM</b> Polyoxymethylene (Acetal Copolymer) TS: 62 - 70 MPa EAB: 20 - 75% TM: 2.2 - 5.5 GPa LTST: 104°C HDT = 116°C Cost: ♦♦</td> </tr> <tr> <td></td> <td><b>POM</b> Polyoxymethylene (Acetal Homopolymer) TS: 67 - 85 MPa EAB: 15 - 70% TM: 2.9 - 3.6 GPa LTST: 85°C HDT = 124°C Cost: ♦♦</td> <td><b>LCP</b> Liquid Crystal Polymer (Aromatic poly(ester)) TS: 55 - 165 MPa EAB: 1.3 - 2.8% TM: 2 - 20 GPa LTST: 230°C HDT: 200°C Cost: ♦♦♦♦</td> <td><b>EVOH</b> Ethylene-vinyl Alcohol TS: 37 - 205 MPa EAB: 100 - 330% TM: 1.9 - 3.5 GPa LTST: 80 - 100°C HDT = 70 - 90°C Cost: ♦♦♦♦</td> <td><b>PPS</b> Polyphenylene Sulphide TS: 69 - 124 MPa EAB: 1 - 5% TM: 2.2 - 5.5 GPa LTST: 180 - 260°C HDT = 174°C Cost: ♦♦♦</td> </tr> <tr> <td></td> <td><b>PFA</b> Perfluoroalkoxy TS: 15 - 30 MPa EAB: 300% TM: 0.60 GPa LTST: 260°C HDT = 48 - 60°C Cost: ♦♦♦♦♦</td> <td><b>ECTFE</b> Ethylene-chlorotrifluoroethylene TS: 42 - 48 MPa EAB: 200% TM: 1.4 GPa LTST: 140 - 166°C HDT = 63 - 67°C Cost: ♦♦♦♦♦</td> <td><b>FEP</b> Fluorinated ethylene-propylene TS: 15 - 21 MPa EAB: 240 - 350% TM: 0.35 - 0.50 GPa LTST: 160°C HDT = 48 - 60°C Cost: ♦♦♦♦♦</td> <td><b>PTFE</b> Polytetrafluoroethylene TS: 17 - 21 MPa EAB: 140 - 400% TM: 1.3 GPa LTST: 250 - 260°C HDT = 50 - 60°C Cost: ♦♦♦♦</td> </tr> <tr> <td></td> <td><b>PCTFE</b> Polychlorotrifluoroethylene TS: 30 - 40 MPa EAB: 175% TM: 1.3 GPa LTST: 140 - 150°C HDT = 67 - 75°C Cost: ♦♦♦♦♦</td> <td><b>ETFE</b> Ethylene-tetrafluoroethylene TS: 35 - 45 MPa EAB: 200 - 500% TM: 1.00 GPa LTST: 160°C HDT = 90°C Cost: ♦♦♦♦♦</td> <td><b>PVDF</b> Polyvinylidene fluoride TS: 30 - 55 MPa EAB: 50% TM: 1.3 GPa LTST: 150°C HDT = 75 - 82°C Cost: ♦♦♦♦</td> </tr> </table>	<b>PE-LD</b> Low Density Polyethylene TS: 7.0 - 25 MPa EAB: 50 - 400% TM: 0.15 - 0.35 GPa LTST: 40 - 70°C HDT = 35°C Cost: ♦	<b>PE-LLD</b> Linear Low Density Polyethylene TS: 8.0 - 20 MPa EAB: 50 - 500% TM: 0.2 - 1.0 GPa LTST: 44 - 50°C HDT = 37 - 44°C Cost: ♦	<b>PE-MD</b> Medium Density Polyethylene TS: 14 - 25 MPa EAB: 50 - 300% TM: 0.25 - 0.70 GPa LTST: 38 - 70°C HDT = 38 - 43°C Cost: ♦♦	<b>PMP</b> Polymethyl pentene TS: 25 - 28 MPa EAB: 15 - 30% TM: 1.0 - 2.2 GPa LTST: 55 - 60°C HDT = 40 - 50°C Cost: ♦♦♦	<b>EVA</b> Ethylene-vinyl Acetate (12% VA) TS: 10 - 19 MPa EAB: 50 - 750% TM: 0.04 - 0.14 GPa LTST: 50°C HDT = 20 - 23°C Cost: ♦♦♦	<b>PE-HD</b> High Density Polyethylene TS: 10 - 50 MPa EAB: 400 - 800% TM: 0.18 - 1.6 GPa LTST: 55°C HDT = 46°C Cost: ♦	<b>PP</b> Polypropylene (Homopolymer) TS: 33 MPa EAB: 150% TM: 1.5 GPa LTST: 100°C HDT = 65°C Cost: ♦	<b>PP</b> Polypropylene (Copolymer) TS: 25 MPa EAB: 300% TM: 1.2 GPa LTST: 90°C HDT = 60°C Cost: ♦	<b>PE-Chlorinated</b> Chlorinated Polyethylene TS: 12.5 MPa EAB: 700% TM: 0.002 GPa LTST: 60°C HDT = 25°C Cost: ♦♦♦	<b>PE-VLD</b> Very Low Density Polyethylene TS: 34 - 400 MPa EAB: 400 - 700% TM: 0.10 - 0.20 GPa LTST: 60°C HDT = 75 - 95°C Cost: ♦♦♦		<b>EMA</b> Ethylene-methyl Acrylate TS: 9 - 12 MPa EAB: 750 - 800% TM: 0.03 GPa LTST: 55°C HDT = 59°C Cost: ♦♦♦	<b>PBT</b> Polybutylene-terephthalate TS: 30 - 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**KEY TO MAJOR POLYMER FAMILIES:** Styrenes Polyolefins Vinyls Cellulosics Polyesters Polyamides Acrylics Polycarbonates Acetals Polysulphones Imides Fluoropolymers