

Meaning and Relevance of Some Material Properties of Plastics

Property	Meaning	Relevance
Melt flow rate (MFR)	Rate of flow of a polymer melt through a standard orifice of a capillary at a chosen temperature under a fixed load	Single parameter useful to differentiate flow characteristics of different grades within the same polymer family; useful to verify lot-to-lot uniformity of a product
Tensile modulus	Ratio of tensile stress to corresponding strain in the linear range	Indicator of inherent rigidity of the plastic
Poisson's ratio	Relative deformations in lateral and corresponding longitudinal directions in response to applied axial stress	Useful in estimation of bulk modulus from tensile modulus for isotropic material
Creep modulus	Apparent modulus of the plastic under constant loads for a long duration of time	Indicator of reduction in modulus of the material, useful in predicting dimensional changes as a result of long-term loads
Shear stress	Ratio of shear stress to resulting angular strain in the range of small deformations	Useful in buckling analysis
Notched impact strength	Amount of energy absorbed in propagating a predefined notch under high rates of impact loading	Indicator of the notch sensitivity and ductile-brittle transition temperature
Deflection temperature under load (DTUL)	Temperature corresponding to a deflection of 0.25 mm (0.01 inch) under a prescribed load generating a fixed fiber stress	Reference point for quality control
Continuous-use temperature	Highest temperature at which a plastic can be expected to retain its performance under continuous exposure for extended periods of time	Indicator of the maximum application temperature
Coefficient of linear thermal expansion (CLTE)	Measure of change in linear dimensions with temperature	Useful in determining dimensional stability of a molded part with changes in temperatures during use and estimation of thermally induced residual stresses in the part
Relative thermal index (RTI)	The maximum temperature at which the plastic retains 50% of its mechanical or electrical properties when exposed for 10,000 hours	Measure of thermal endurance, i.e., the ability of the plastic to retain 50% of its particular property when exposed to elevated temperature for extended periods of time
Dielectric strength	Maximum voltage a plastic can withstand before electric breakdown	Indicator of insulation characteristics of the plastic
Dielectric constant	Ratio of the capacity of the condenser with the particular dielectric material to the capacity of the condenser with air as the dielectric material	Insulating capacity of the plastic in terms of its ability to store electrical energy
Dissipation factor	Amount of energy dissipated	Measure of inefficiency of the plastic as an insulator

Adapted from SPE's *Plastics Technician's Toolbox. 1. Fundamental Skills and Polymer Science.*