MAY2022

BAMBERGER POLYMERS TECH TIPS

Polymer Morphology

Amorphous and Semi-crystalline

Thermoplastic polymers can be categorized into two general types: amorphous and semi-crystalline.

Amorphous polymers soften and flow-gradually- when heated. When they are subject to a specific temperature range, the material becomes less glassy and more rubber-like or vice versa. As a result, amorphous polymers do not have a true melting point- they have a glass transition temperature (Tg).

Semi-crystalline polymers exhibit a discrete melt temperature. The most common method for determining the percent crystallinity of a sample involves comparing the density of the sample to the fully crystalline (and fully amorphous) densities. The degree of crystallinity has a direct effect on many traits of the polymer. There are varying degrees of crystallinity among different materials as well as variations among the same type of material.

Polymer Types

Amorphous polymers -

- ABS, PMMA, polycarbonate, (atactic) polystyrene, PVC, Rubber latex, styrene-butadiene rubber (SBR)

Characteristics of amorphous materials

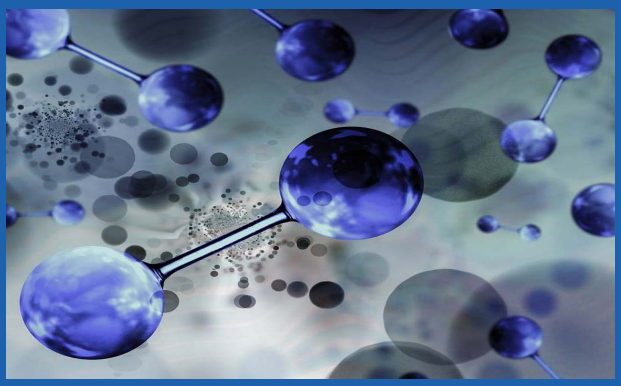
- Soften over a temperature range
- Low modulus ('soft') Transparent
- Low shrinkage
- Poor chemical resistance
- High permeability
- Toughness
- Impact resistance

Crystalline polymers -

Nylon, PET, PBT, polyethylene, polypropylene, POM, PLA, PTFE

Characteristics of crystalline materials

- Discrete melting point
- High modulus (stiffness) Opaque
- (due to light scattering by crystallites)
- Higher shrinkage rates
- Better chemical resistance
- Low permeability
- Brittle



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