

POLYMER MATERIALS (INTRODUCTION)

There are three general groups of polymer materials:

- ☐ **Elastomers**
- ☐ **Thermoplastics**
- ☐ **Thermosets**

Elastomers

Elastomers are polymers possessing high elasticity - may be reversibly stretched at high degree. Elastomers consists of long lightly cross-linked molecules.

Common elastomers are:

- ☐ Polyisoprene (natural rubber)
- ☐ Butyl
- ☐ Nitrile
- ☐ Neoprene
- ☐ Ethylene-Propylene
- ☐ Hypalon
- ☐ Silicone

Elastomers may be strengthened by **vulcanization** process (heat treatment in presence of chemical agents).

Vulcanization results in increase of cross-linking of the molecules.

Vulcanized elastomers are elastic for small deformations.

Thermoplastics

Thermoplastics are polymers, which soften (becomes pliable and plastic) and melt when heated. In the melted conditions thermoplastics may be formed by various methods (injection molding, extrusion, Thermoforming).

No new cross-links form (no chemical curing) when a thermoplastic cools and harden.

Thermoplastics may be reprocessed (re-melt) many times.

Common thermoplastics are:

- ☐ Thermoplastic Low Density Polyethylene (LDPE)
- ☐ Thermoplastic High Density Polyethylene (HDPE)
- ☐ Polypropylene (PP)
- ☐ Acrylonitrile-Butadiene-Styrene (ABS)
- ☐ Polyvinyl Chloride (PVC)
- ☐ Polymethylmethacrylate (PMMA)
- ☐ Polytetrafluoroethylene (PTFE)
- ☐ Polyethylene Terephthalate (PET)
- ☐ Nylon 6 (N6)
- ☐ Polyimide (PI)
- ☐ Polycarbonate (PC)
- ☐ Polysulfone (PSF)

Thermosets

Thermosets are polymers which do not melt when heated.

Thermosets molecules are cross-linked by strong covalent intermolecular bonds, forming one giant molecule.

Cross-linking is achieved in curing process initiated by heat, chemical agents or radiation.

Before curing processing thermoset materials are stored in partially polymerized condition.

Thermosets are stronger and stiffer than thermoplastics.

Source : http://www.substech.com/dokuwiki/doku.php?id=polymer_materials_introduction