

Study of plastic as material for container

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PLASTIC

Plastics may be defined as any group of substances, of natural or synthetic origins, consisting chiefly of polymers of high molecular weight that can be moulded into a shape or form by heat and pressure.

Advantages

- Less weight than glass,
- flexible
- Variety of sizes and shapes
- Essentially chemically inert, strong, rigid Safety use, high quality, various designs
- Extremely resistant to breakage

Disadvantages

- Absorption permeable to moisture
- Poor printing, thermostatic charge

TYPES OF PLASTICS

Thermosetting type –

When heated they may become flexible but they do not become liquid e.g. Urea formaldehyde (UF), Phenol formaldehyde, Melamine formaldehyde (MF), Epoxy resins (epoxides), Polyurethanes (PURs)

Thermoplastics type-

On heating they are softened to viscous fluid which harden again on cooling. e.g. Polyethylene {HDPE – LDPE}, Polyvinylchloride (PVC), Polystyrene Polypropylene, Nylon (PA), Polyethylene terephthalate (PET), Polyvinylidene chloride (PVdC), Polycarbonate Acrylonitrile butadiene styrene (ABS)

Polymers used in preparation of plastic

Polyethylene

- This is used as high and low density polyethylene
- **Low density polyethylene (LDPE)** is preferred plastic for squeeze bottles. Properties: Ease of processing , barrier to moisture, strength /toughness, flexibility, ease of sealing.
- **High density poly ethylene (HDPE)** is less permeable to gases and more resistant to oils, chemicals and solvents. Properties: Stiffness, strength / toughness, resistance to chemicals. It is widely used in bottles for solid dosage forms.
- **Drawback:** prone to stress cracking in the presence of surfactants or vegetable or mineral oils.

Polypropylene

- It has good resistance to cracking when flexed.
- Good resistance to heat sterilization.
- It is colourless, odourless thermoplastic material with excellent tensile properties even at high temperature.
- Excellent resistance to strong acids and alkalis.
- Low permeability to water vapour
- Permeability to gases is intermediate between polyethylene HD and un-plasticized PVC
- Suitable for use in closures , tablet containers and intravenous bottles.

Polyvinyl chloride (PVC):

- Versatility , ease of blending, strength / toughness, resistance to grease/oil, resistance to chemicals, clarity.
- Used as rigid packaging material and main component of intravenous bags.
- Drawback: Poor impact resistance which can be improved by adding elastomers to the plastics but it will increase its permeability.

Poly vinylidene chloride (PVDC):

- Excellent barrier properties against: moisture, water vapour, UV light, aroma, inorganic acids, alkalies, aqueous salt solutions, organic water soluble acids, aliphatic hydrocarbons , esters of long chain fatty acids, detergent base materials, emulsifying agents and wetting agents.
- Good thermoform ability.
- PVDC is very cost-effective, as coating weight can be customized depending on the requirements of the barrier properties.
- Medical grade and non-toxic.
- High levels of transparency which improves the aesthetics of the product.

CHARACTERISTICS OF PACKAGING MATERIAL

The material selected must have the following characteristics:

- Must meet tamper-resistance requirements
- Must be FDA approved
- Must be non-toxic
- Must not impart odor/taste to the product
- Must not reactive with the product
- They must protect the preparation from environmental conditions

Type III—soda lime glass

- Containers are untreated are made of commercial soda lime glass of average or better than average chemical resistance.
- It contains high concentration of alkaline oxides and imparts alkalinity to aqueous substance

Uses

- Used for all solid dosage form
- For oily preparation

NP—soda glass (non parenteral usage)

- Containers are made up of soda lime
- Glass supplied for non-parenteral product intended for oral to topical use.