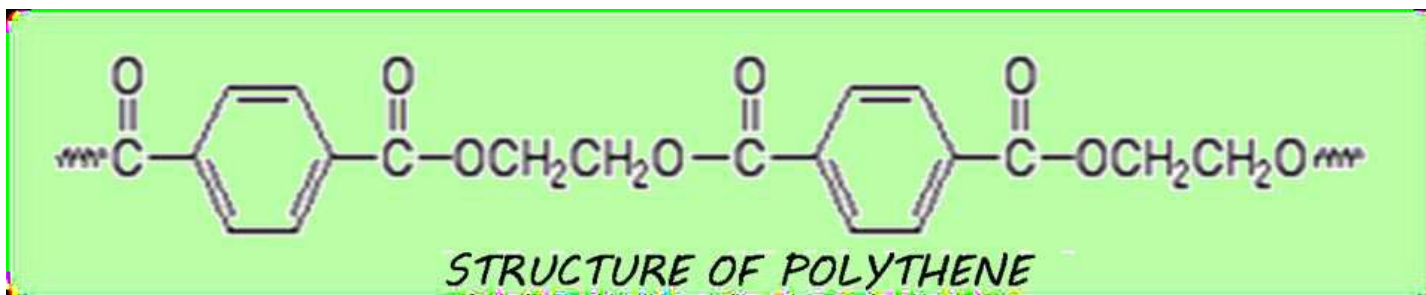
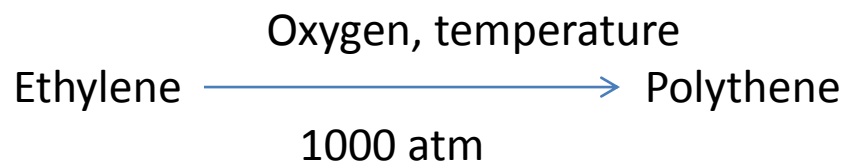


Characteristics of plastic material

Soma Maji

What is plastic?

- Plastic is a material consisting of any of a wide range of synthetic or semi-synthetic organic compounds that are malleable and can be molded into solid objects
- Or,
- Plastics are polymers, large molecules made of repeating units of smaller molecules (monomers) that are chemically bound together. A polymer is like a chain in which each link is a monomer.



Type of plastic

1. Thermo plastic
2. Thermoset

Thermo plastic

Thermoplastics (Thermo=heat Plastic =A State Between Solid And Liquid) Are Made Of **Long Chain Molecule** That Are **Entangled With Each Other** **But Not Bonded Together**.

- Thermoplastic Materials Can Be Cooled And Heated Several Times.
- They Can Be Recycled.
- Thermoplastic Can Be Moulded Into Any Shape.

Eg. Polyethylene

Polyvinyl Chloride (Pvc)

Nylon And Teflon

Polypropylene

Polystyrene



Thermoset or thermosetting plastic

Thermosetting Made From Long Chain Molecules Tied With Strong Covalent Bond And Cross Linked .This Cause Plastic Became Rigid And Not Flexible Even At High Temperature.

They Are Better Suited To High-Temperature Applications Up To The Decomposition Temperature.

They Are More Brittle.

EXAMPLES--

Phenolic resin

Amino and epoxy resin

Bakelite

Polyurethane

Vulkanized rubber



Difference??

Thermoplastic	Thermosetting
When heated become soften and melted and become hard on cooling ;	Become hard on heating;
process is reversible	process is irreversible
They Can be molded and remolded	They can molded once and cannot remolded and reshaped
They are addition polymer	They are condensation polymer
Structure is generally linear	Structure is cross-linked

Different type of plastic material

Type	Full form	Use
PET	Poly Ethylene Pterephthalate	Fizzy drink bottles and oven-ready meal trays
HDPE	High-density polyethylene	Bottles for milk and washing-up liquids.
PVC	Polyvinyl chloride	Food trays, cling film, bottles for squash, mineral water and shampoo.
LDPE	Low-density polyethylene	Carrier bags and bin liners.
PP	Polypropylene -	Microwaveable meal trays, margarine tubs
PS	Polystyrene	Pots, fish trays, boxes and cartons, cups, plastic cutlery

Advantage of plastic

- Excellent thermal and electrical insulation properties.
- Relatively inexpensive to produce.
- Lighter weight than competing materials, reducing fuel consumption during transportation.
- Resistance to chemicals, water and impact.
- Versatile use, modification is possible
- Energy requirements for conversion of plastics is 4-5 times less than that of Glass and 30-40 times less as compared to paper.
- Multilayers can be used: Collapsible tube has additional benefits like wrinkle resistance, decorative printing, light weight.
- Cost of plastics is comparatively lower than that of glass and metal containers.
- Consumer's convenience at lower cost
- Compared to metal containers. Grips can be provided, without adding much to cost so its easy to open.
- Retortable pouches helps in high temperature processing of food at low cost.
- Ease in Transportation and Distribution

Disadvantages

Decomposition:

The main disadvantage of plastic is the sheer amount of time they take to decompose--the average plastics takes 500 years. Plastic's decomposition can be affected by various factors, such as the type of plastic, the climate and acids in the landfill; plastic still lasts a long time, filling landfills for an indefinite period.

Difficult to recycle:

Glass bottles can be melted and easily reused, as can tin cans. Recycling plastic is not so simple. Much of the plastic placed in recycling boxes is not recycled at all, as most plastic cannot be recycled. Those bottles that are recycled are not used to make new bottles. Instead, recycled plastic bottles are used to make non-recyclable products, such as T-shirts, plastic lumber or parking lot bumpers. This means more raw materials need to be used to create new plastic bottles than is the case with easily recycled material, such as glass or tin.

Non Renewable:

Plastic is manufactured using oil byproducts and natural gas, materials that could be used in numerous other applications or conserved were plastic usage lower. Natural gas, for example, can be used to heat houses and cook food. Using plastic in the volume we currently do reduces the availability of these resources, which are gone forever when used up.

Hard to reuse:

The standard disposable plastic bottle is meant for one use, not many. Recycled plastic bottles are not refilled in-mass the way glass beer bottles are, and flimsy plastic bottles do not lend themselves well to at-home re-usage. Water bottles, for example, are often reused in the home but become less and less sturdy over time and are ultimately throwaway.

Threat to animals:

Discarded Plastic usually ends up within marine sources. The Pacific Ocean has one of the largest dumping ground for plastics, unknown numbers of sea birds marine mammals and fish ingest plastics which causes a variety of negative health effects.

PLASTIC WASTE

1. Polyethylene Terephthalate (PETE)
2. High-density Polyethylene (HDPE)
3. Polyvinyl Chloride (PVC)
4. Low-density Polyethylene (LDPE)
5. Polypropylene (PP)
6. Polystyrene (PS)
7. Others (Polycarbonate)

Plastic pollution

- Plastic is one of the few new chemical materials which pose environmental problem.
- Plastic in the environment is regarded to be more an aesthetic nuisance than a hazard, since the material is biologically quite inert.
- Plastic is cheap, it gets discarded easily, and, its persistence in the environment can do great harm.



- Plastics Release Pollutants like Poly brominated di-phenyl ethers (PBDE), Nonylphenols, Bisphenol A, Phthalates
- Plastics Absorb Hydrophobic Pollutants like Polychlorinated biphenyls (PCBs), Dichloro Diphenyl Trichloro ethane (DDT), Dichloro Diphenyl Dichloro ethylene (DDE)
- Many plastics, particularly PVC, when burned result in emissions of the deadly poisons named dioxin.
- Dioxins are highly persistent compounds, with the potential to become increasingly concentrated in living tissues as they move up the food chain. It is often considered to be the man-made compound most toxic to animals.



Recycle code



PETE



HDPE



PVC



LDPE



PP



PS



OTHER

POLYETHYLENE TEREPHTHALATE

Description: It has become extremely popular for food and drink packaging purposes because of its strong ability to create a liquid and gas barrier - so oxygen cannot get in to spoil food, and the carbon dioxide that makes drinks fizzy cannot get out.

Properties: clarity, lightness, strength, toughness, barrier to liquid and gas.

Use: bottles (water, soft drink, juice, beer, wine, jam jars, detergent and cleaner containers, insulation for wire and insulating tapes, Used in guitars, pianos and vehicle/yacht interiors.

Health concern:

- (A toxic chemical) leaching from water bottles that have been placed in heat for prolonged times.
- PET plastic should not be reused because cleaning detergents and high temperatures can cause chemicals to leach out of the plastic.



HIGH-DENSITY POLYETHYLENE



Description: HDPE has long virtually unbranched polymer chains which align and pack easily making it dense and very crystalline (structurally ordered) . a stronger thicker form of polyethylene.

Properties: resistance to moisture, permeability to gas, ease of processing.

Typical use: Plastic bags (grocery), milk, water, and juice containers, bleach, detergent and shampoo bottles, garbage bags, dishes, some medicine bottles. Also used in insulation, piping, plastic/wood composites.

Toxicity:

- It is generally considered a safer plastic for food and drink use.
- It can leach the endocrine disruptor nonylphenol (added to HDPE as a stabilizer), especially when exposed to ultraviolet light - Sunlight



POLYVINYL CHLORIDE (PVC)



Description: Synthetic Man-made Material Made From Ethylene And Chlorine

- It Is The Third-most Widely Produced Plastic.
- Low Cost Material To Produce, Very Durable.

Properties: Versatility, Ease Of Blending, Strength, Toughness, Clarity, Transparency.

Typical use: Toys, Non-food Packaging, Squeeze Bottles, Shampoo Bottles, Mouthwash Bottles, Cooking Oil And Peanut Butter Jars, Detergent And, Shower Curtains, Medical Tubing, Wire And Cable Insulation, Carpet Backing And Flooring., Credit Cards, Piping (For Plumbing, Window Frames,, And Other Construction Materials.

Health concern:

- It May Leach A Variety Of Toxic Chemicals Including, Bisphenol A (BPA), Phthalates, Lead, Dioxins, Mercury, And Cadmium.
- When PVC Is Burned (Via Waste Incineration, Car Or Home Fires), Dioxins Are Formed.
- Dioxins Are Known Human Carcinogens And Persistent Organic Pollutants, And Are Considered One Of The Most Toxic Types Of Chemicals Ever Tested.



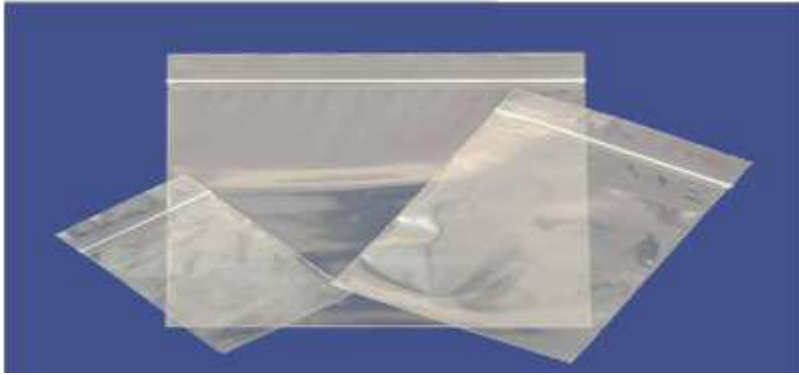
LOW DENSITY POLYETHYLENE (LDPE)



Description: LDPE polymers have significant chain branching including long side chains making it less dense and less crystalline, thinner more flexible form of polyethylene.

Properties: Flexibility, resistance to moisture, ease of sealing, ease of processing.

Typical use: Mostly for film applications like bags (grocery, dry cleaning, bread, frozen food bags, newspapers, garbage), plastic wraps; Coatings for paper milk cartons and hot & cold beverage cups; some squeezable bottles (honey, mustard), food storage containers, container lids, Wire and cable covering



POLYPROPYLENE (PP)



Description: Polypropylene is a plastic polymer with the chemical formula C_3H_6

- Polypropylene is used for similar applications as polythylenes.
- Generally stiffer and more heat resistant - so is often used for containers filled with hot food.
- It's crystallinity (structural order affecting hardness & density) is quite high, somewhere between LDPE and HDPE.

Properties: Resistance to heat, chemicals, grease & oil, barrier to moisture.

Typical use: Food containers (ketchup, yogurt, cottage cheese, margarine, syrup medicine containers, straws, bottle caps, including baby bottles). Other uses include disposable diaper and sanitary pad liners, thermal vests, car parts (bumpers, carpets, fixtures)

Health concern:

Being relatively stable although it has been shown to **leach plastic additives** (such as the stabilizing agent oleamide) when PP lab ware was used in scientific experiments.



POLYSTYRENE (PS)



Description: It is a synthetic aromatic polymer made from the monomer styrene

- Apart from low cost, low strength foam, PS can be made as a clear, glassy, hard polymer used for things like cutlery and cd cases.
- It is highly flammable.

Typical use: styrofoam food containers, egg cartons, disposable cups and bowls, take-out food containers, food plates, bike helmets. Cutlery & razors, compact disc & dvd cases, licence plate frames, medicine bottles, test tubes, petri dishes, model assembly kits.

HEALTH CONCERN -PS food containers can leach styrene, which is reasonably anticipated to be a human carcinogen (PS1, PS2) and is considered a brain and nervous system toxicant (PS1, PS3, PS4).



Types of Plastics You're Using (And which ones you shouldn't)



PETE



HDPE



V



LDPE



PP



PS



OTHER



Safest Choice



Use with Caution



Avoid

Re cycling of plastic

