Difference Between Polycarbonate and ABS

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Key Difference – Polycarbonate vs ABS

Polycarbonate and ABS are widely used thermoplastic elastomers and have their unique set of properties. These properties have made these polymers to be used in wide range of applications. The key difference between polycarbonate and ABS is that **polycarbonate is an amorphous polymer made from melt polycondensation of bisphenol A and diphenyl carbonate, whereas ABS is a polymer blend made of acrylonitrile, butadiene, and styrene.**

What is Polycarbonate?

Polycarbonate is an amorphous polymer with excellent transparency, high hardness, and excellent impact resistance. Moreover, it has excellent creep resistance and very good dimensional stability. Most importantly, polycarbonate is high-temperature resistant (over 120 C); thus it is suitable for items that undergo frequent steam autoclave sterilization. In addition, this thermoplastic has good electrical characteristics and self-extinguishing properties. Polycarbonate is produced by melt polycondensation of bisphenol A and diphenyl carbonate. It can be processed by injection moulding, and by extrusion blow-moulding.

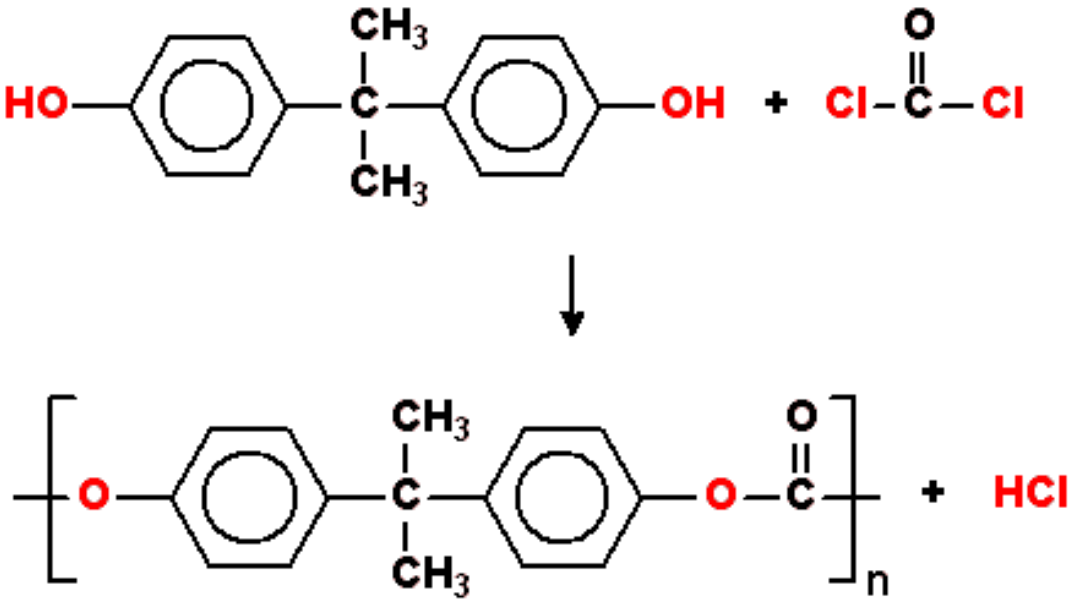

Figure 01: Synthesis of Polycarbonate

Transparent polycarbonate films are used to make lenses, windshields, containers, light fittings, compact discs (CD), and appliance parts. Its high temperature resistant property has been considered when making hot-dish handlers, coffee pots, hair dryers

and other appliance housings. Moreover, it supplies excellent impact and flexural properties for pump impellers, helmets, small appliances, trays, aircraft parts, beverage dispensers and certain packaging applications. The structure of polycarbonate chain can be changed by the addition of various radicals as side groups or replacing the benzene ring by carbon atoms. The disadvantages of polycarbonate include its high processing temperature, poor alkaline resistance, requirement of ultraviolet stabilization, and poor aromatic solvent resistance. Polycarbonate can be blend with ABS for various applications.

What is ABS?

ABS thermoplastic resins is composed of three kinds of monomers: acrylonitrile, butadiene, and styrene. It is a blend of all these three monomer units. Each monomer type has its own properties. For example, acrylonitrile provides chemical and fatigue resistance, hardness, and melt strength, while butadiene provides good impact resistance. Moreover, styrene provides heat resistance, processability, color and hardness. Therefore, ABS has a unique set of properties including impact resistance, good processability, good mechanical properties, high heat distortion temperature, and gloss property. These properties make ABS to be used in a broad field of applications, including piping and fittings, instrument and appliance housings, tool housings such as hand drills, electric screw drivers, automotive instrument panels and home appliances.

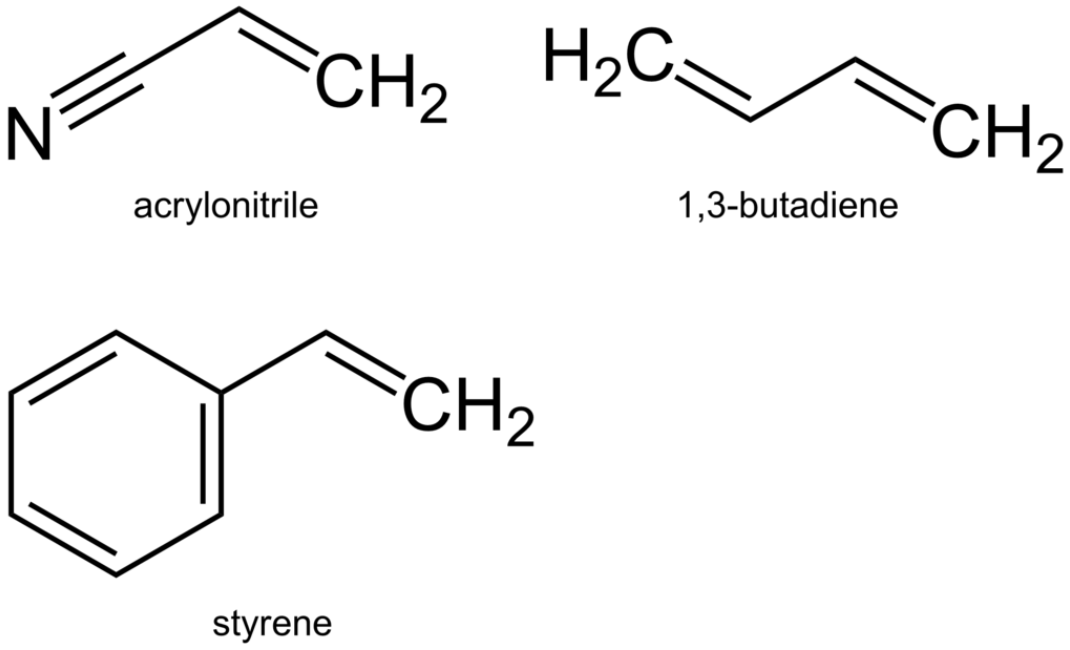

Figure 02: Monomers of ABS

Mass and emulsion polymerization and mass suspension method are widely employed to produce grafted ABS. Flame-retardant ABS are produced by addition flame retardant (halogen-based organic compound), impact modifier, stabilizer, and lubricant. Flame-retardant ABS are widely used as components of automation equipment such as

printers, copiers and various kinds of office electronics. Extrusion of ABS are used to make inner door cabinets of refrigerators, bathtubs, and door covers.

Figure 03: Lego Boxes made from ABS

What is the difference between Polycarbonate and ABS?

Polycarbonate vs ABS	
Polycarbonate is an amorphous polymer made by melt polycondensation of bisphenol A and diphenyl carbonate.	ABS is a thermoplastic resins made by blending three types of monomers: acrylonitrile, butadiene, and styrene.
Properties	
Polycarbonate has excellent creep resistance, very good dimensional stability, good electrical characteristics, self-extinguishing properties, excellent impact, and flexural properties.	ABS has impact resistance, good processability, good mechanical properties, high heat distortion temperature, and gloss property.
Applications	
Polycarbonate is used for the manufacture of lenses, windshields, containers, light	ABS is used for the manufacture of piping and fittings, instrument and appliance

fittings, compact discs (CD), pump impellers, helmets, small, appliances and trays.	housings, components of office automation equipment, inner door cabinets of refrigerators, bathtubs, and door covers.
Hardness and Flexibility	
Polycarbonate is extremely hard, brittle and not flexible.	ABS is hard and flexible due to rubbery part.
Processability	
Polycarbonates require high temperatures to process, so their processability is low.	ABS has good processability.

Summary – Polycarbonate vs ABS

Polycarbonate is an amorphous thermoplastic polymer with excellent impact resistance, rigid and temperature resistance. It is made from bisphenol A and disphenyl carbonate. ABS is made from three types of monomers: acrylonitrile, butadiene, and styrene. ABS has impact resistance, processability, heat distortion temperature, and gloss property. This is the difference between polycarbonate and ABS.

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