



The Different Types of Polyethylene: LDPE, HDPE, LLDPE, UHMW, MDPE, and XLPE

Polyethylene PE is a polyolefin. Polyethylene is a thermoplastic polymer with variable crystalline structure and an extremely large range of applications depending on the particular type. It is one of the most widely produced plastics in the world (tens of millions of tons are produced worldwide each year). The commercial process (the Ziegler-Natta catalysts) that made PE such a success was developed in the 1950s by German and Italian scientists Karl Ziegler and Giulio Natta.

Polyolefins are high molecular weight hydrocarbons. Polyolefins include linear low-density polyethylene, low-density polyethylene, high-density polyethylene, polypropylene copolymer, polypropylene, and polymethyl pentene. These are the only plastics that have lower specific gravity than water. This means that they weigh less than water. These materials can become brittle from oxidation and are damaged by exposure to UV light. When ethylene is polymerized, the result is relatively straight polymer chains. From the main chain, they can branch out. We get different kinds of Polyethylenes from the varying degree of branching in their molecular structure. Listed Below are the types of polyethylenes'.

LDPE (Low-Density Polyethylene) is widely used for manufacturing various containers, dispensing bottles, wash bottles, tubing, plastic bags for computer components, and various molded laboratory equipment. Its most common use is in plastic bags. Other products made from it include: Trays and general purpose containers. (Low-Density Polyethylene) has the most excessive branching. This causes the low density to have a less compact molecular structure which is what makes it less dense. It has a density of 0.910-0.925g/cm³.

HDPE (High-Density Polyethylene) What is HDPE primarily used for?

More than 8 million tons of HDPE are used toward blow-molded containers such as milk jugs, juice containers, detergent bottles, motor oil bottles, trash bins, etc. ...
A large portion of recycled HDPE plastic is made into composite wood or plastic lumber.
Toys! ...has minimal branching of its' polymer chains. HDPE is more rigid and less permeable than the LDPE. It has a density of 0.941-0.965g/cm³.

LLDPE (Linear Low-Density Polyethylene) What is LLDPE used for?

LLDPE has higher tensile strength and higher impact and puncture resistance than does LDPE. It is very flexible and elongates under stress. It can be used to make thinner films, with better environmental stress cracking resistance. It has good resistance to chemicals. Polyethylene has a significant number of short branches. Because it has shorter and more branches, its chains can slide against each other upon elongation without becoming entangled like LDPE which has long branching chains that would get caught on each other. This gives LLDPE higher tensile strength and higher impact and puncture resistance than the LDPE. It has a density of 0.91-0.94g/cm³. MDPE (Medium Density Polyethylene) has a little less branching than the HDPE. It is less notch sensitive than HDPE and has better stress cracking resistance. It has a density range of 0.926 - 0.940 g/cm³ MDPE can be produced by chromium/silica catalysts, Ziegler-Natta catalysts or metallocene catalysts. MDPE has good shock and drop resistance properties, less notch sensitive and the Stress cracking resistance is better than that of HDPE. MDPE is typically used in gas pipes and fittings, sacks, shrink film, packaging film, carrier bags, and screw closures.

UHMWPE (Ultra High Molecular Weight Polyethylene) What is UHMW used for?

Extremely tough abrasion resistant, low cost plastic, used for a wide range of wear applications. UHMW (ultra high molecular weight polyethylene) is an extremely tough plastic with high abrasion and wear resistance. ... Applications include UHMW wear strips, chain guides, and marine dock fender pads.

has extremely long chains, with molecular weight numbering in the millions (usually between 2 to 6 million). In general, HDPE molecules have between 700 and 1,800 monomer units per molecule, whereas UHMWPE molecules tend to have 100,000 to 250,000 monomers each. The chains of UHMW align in the same direction. The bonds between the chains are not very strong; however, because they are so long more bonds are holding it together than polyethylene with shorter chains. These long chains give UHMW high tensile strength. The longer chains serve to transfer load more effectively to the polymer backbone by strengthening intermolecular interactions. This causes the material to be very tough and gives it the highest impact strength of the polyethylenes. It has a density of 0.928-0.941 g/cm³.

XLPE (Crosslinked Polyethylene) Cross linked polyethylene is often used for pipe and tubing in the plumbing industry. Probably the most common reason for using PEX is to replace traditional galvanized steel, copper and PVC piping due to rusting, cost and circulation. Cross linking can solve plumbing issues at competitive pricing and can sometimes be easier to install. Cross linked polyethylene can also be useful in the electric industry too.

Important Benefits

There are many benefits to cross linked polyethylene. Some include:

Works with a variety of voltage ranges 600V to 35kV

Provides mechanical protection

Can withstand extreme pressure

Resists underground damage

Weather resistant

Thermal resistance

Permits high conductor operating temperatures

Reduces short circuit and overload levels

Is more cost effective than traditional solutions

Flexible

Moisture resistant is high-density polyethylene which has covalent bonds between connecting its polymer chains. These bonds are caused by using heat plus chemicals or radiation, and they help to form 3-dimensional polymers with high molecular weights. These bonds tie the polymers together and lengthening the polymer chains giving it better physical properties. The molecular structure that is formed by crosslinking provides superior stress cracking, improved toughness, stiffness, and chemical resistance compared to the HDPE.