PE PE COMPOUND, XLPE, PEX, CATALYST

XLPE

Cross-Linked PE

In the middle to late 1950s, crosslinkable polyethylene compounds were introduced for coating power cable and other specialized constructions. The unusual and outstanding electrical properties of polyethylene are extended to higher operating temperatures when used in crosslinkable materials. Crosslinked compounds, however, are not thermoplastic and will not melt upon reheating. The process of crosslinking changes polyethylene and EVA copolymers from a thermoplastic series of polymer chains into a single interwoven molecule. This change produces improved heat resistance, allows compounds to incorporate higher filler loadings, improves environmental stress crack resistance and gives higher tensile strength. For medium voltage applications, reactivity can be boosted significantly. This results in higher line speeds in cases where limitations in either the curing or cooling processes within the continuous vulcanization (CV) tubes used to cross-link the insulation. XLPE insulations can be modified to limit the amount of by-product gases generated during the cross-linking process. This is particularly useful for high voltage cable and extra-high voltage cable applications, where degassing requirements can significantly lengthen cable manufacturing time

CATALYST MASTERBACH

For XLPE

Silane grafted XLPE Compound of Sioplas Method for wires and cables. In the Sioplas process, Polyethylene is first grafted in the presence of a mixture of Vinylsilane and peroxide to make a crosslinkable polyethylene. The material can be either processed directly or stored in dry conditions for up to several months. In a Separate step, the crosslinking catalyst, typically a tin derivative such as dibultinlaurate (DBTDL) and an anti-oxidant are mixed with polyethylene in a single or twin-screw extruder. This is the catalyst masterbatch, part B, to be used with the silane polyethylene, part A. In a second step, grafted polyethylene is dry blended with a catalyst masterbach (a concentrate of Tin derivative in PE), in a traditional single screw extrusion process. The extrudate is most of the time cooled down into a water bath which provides the moisture necessary for crosslinking. The reaction is fast but diffusion of moisture in the material is a limiting factor. For this reason, hot water bath or low pressure steam autoclave are often used to speed up crosslinking.

PE COMPOUND

Compounds

Its unusual electrical properties make tough, flexible, chemically inert polyethylene an outstanding insulator for electrical wire and cable. High density polyethylenes are preferable to low density resins for some wire and cable coating applications. They have higher abrasion resistance and can better withstand mechanical abuse. High density resins also exhibit greater tear resistance than low density types, as well as higher tensile and shear strength. High dielectric strength and very low electric conductivity make polyethylene an outstanding insulator for electric power cable at low as well as high transmission voltages. Polyethylene is also the most suitable dielectric for all types of high frequency cables because of its low dielectric loss at high frequencies and its remarkable mechanical properties. The power factor of polyethylene which provides the measure of the power loss in the insulated conductor increases slightly with an increase in the temperature of the atmosphere or the electrical equipment, both of which may fluctuate widely. It also increases slightly with an increase in the humidity of the surroundings.

PEX

Cross-Linked PE

Low-temperature impact strength, abrasion resistance and environmental stress cracking resistance can be increased significantly by crosslinking, whereas hardness and rigidity are somewhat reduced. PEX does not melt any more (analogous to elastomers) and is thermally resistant (over longer periods of up to 120 °C, for short periods without electrical or mechanical load up to 250 °C). With increasing crosslinking density also the maximum shear modulus increases (even at higher temperatures). PEX has significantly enhanced properties compared with ordinary PE. Crosslinking enhances the temperature properties of the base polymer. Adequate strength to 120–150 °C is maintained and chemical stability enhanced by resisting dissolution.[citation needed] Low temperature properties are improved. Impact and tensile strength, scratch resistance, and resistance to brittle fracture are enhanced.

Almost all PEX used for pipe and tubing is made from high-density polyethylene (HDPE). PEX contains cross-linked bonds in the polymer structure, changing the thermoplastic to a thermoset. Cross-linking is accomplished during or after the extrusion of the tubing.