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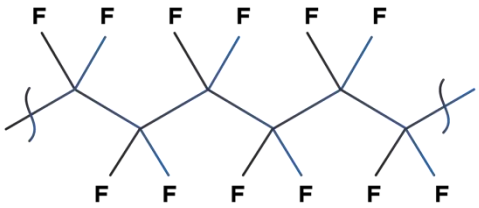
PlasticsEurope
Association of Plastics Manufacturers
Fluoropolymers Product Group

Fluoropolymers *are very different in composition and structure as well as physical, chemical and biological properties* versus Side-Chain Fluorinated Polymers.

Fluoropolymers (FP)

Composition and Structure



Polytetrafluoroethylene, PTFE

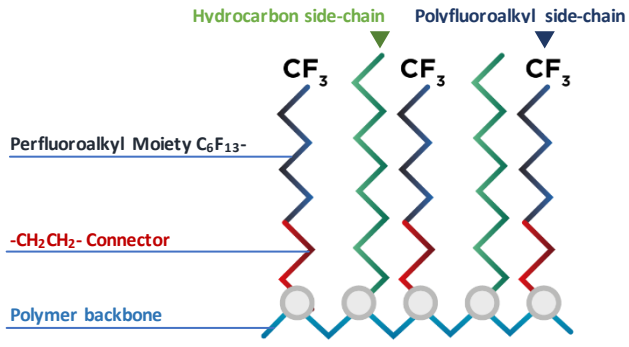
Fluoropolymers, such as polytetrafluoroethylene (PTFE), have *a carbon atom backbone with fluorine atoms (F) bound to the polymer backbone carbon atoms*. Fluoropolymers have molecular weights up to millions, meaning thousands of connected carbon atoms to which fluorine is bound.

Imagine a string of pearls one hundred thousand pearls long, each pearl representing a carbon bearing fluorine.

Properties

Fluoropolymers have *material properties*. The unique properties of fluoropolymers include durability, mechanical strength, inertness, thermal stability, and resistance to chemical, biological, and physical degradation. Some can be classed as Polymers of Low Concern according to OECD criteria as they are chemically stable, biologically stable/inert, negligibly soluble in water, non-bioavailable, non-bioaccumulative; and non-toxic. (Henry et al. 2018).

Side-Chain Fluorinated polymers (SFP / SCFP)



Side-Chain Fluorinated Polymer "comb" structure

Composition and Structure

Side-Chain Fluorinated Polymers are a *hydrocarbon polymer backbone* with a polyfluoroalkyl side-chain bound to the backbone that contains a six-carbon perfluoroalkyl moiety as well as side-chains that have no fluorinated carbons.

The polymer has a comb structure where some of the tines (aka teeth) are a side-chain with the perfluoroalkyl moiety (imagine six pearls, using the analogy above) while other side chains contain hydrocarbon functionality, no fluorine.

Properties

Side-chain fluorinated polymers have *surface properties*. They are polymer dispersions in water used as coatings applied to textiles, carpets, nonwovens and paper to provide water, soil, oil and stain resistance.

Reference: Henry, et al., **2018**. A Critical Review of the Application of Polymer of Low Concern and Regulatory Criteria to Fluoropolymers. *Integrated Environmental Assessment and Management* 14(3): 316-334. http://dx.doi.org/10.1002/ieam.4035