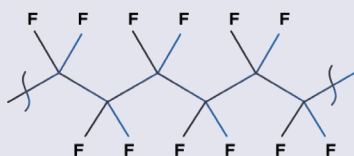


Differentiating Fluorinated Polymers

Fluoropolymers ≠ Side-Chain Fluorinated Polymers

Fluoropolymers **are very different** in composition and structure and therefore **have very different** physical, chemical, and biological properties compared to side-chain fluorinated polymers.

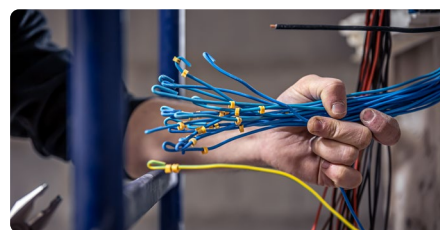
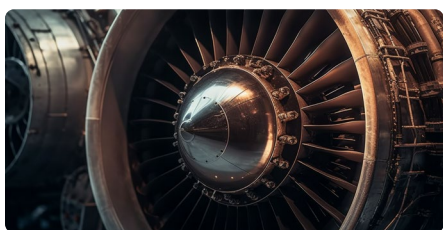
Fluoropolymers



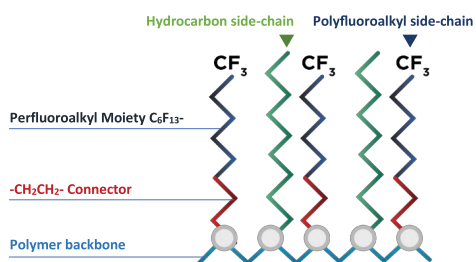
Polytetrafluoroethylene, PTFE

Composition and Structure: Fluoropolymers are a distinct subset of fluorinated polymers characterized by a carbon-only polymer backbone with fluorine atoms directly attached to it. Peer reviewed studies have documented that fluoropolymers are large, stable, inert molecules that are not soluble in water (Henry et al. 2018; Korzeniowski et al. 2022). As such, they are too large to cross biological membranes and do not present bioaccumulation concerns. In addition, fluoropolymers meet criteria used to identify polymers of low concern for impacts on human health or the environment.

Properties: Fluoropolymers have material properties. They possess a unique combination of significant durability, thermal resistance, chemical resistance, mechanical resilience, and other desirable properties that makes them the material of choice in many challenging operating environments. They impart a wide range of performance characteristics that are vital for the manufacture and performance of medical devices, semiconductors, telecommunications infrastructure, and advanced transportation and aerospace applications, among many others.



Side-Chain Fluorinated Polymers



Side-Chain Fluorinated Polymer "comb" structure

Composition and Structure: Side-Chain Fluorinated Polymers are another distinct group of fluorinated polymers. They have a comb-like structure characterized by a hydrocarbon polymer backbone with a partially fluorinated side-chain (the teeth of the comb) bound to the backbone. Some side-chains may contain no fluorinated carbons.

Properties: Side-Chain Fluorinated Polymers have surface properties. They are dispersed in water and used as coatings applied to textiles, non-woven fabrics, and other products to provide resistance to stains, water, soil, and oil.



References:

- 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>
- Korzeniowski et al. 2022. A Critical Review of the Application of Polymer of Low Concern Regulatory Criteria to Fluoropolymers II: Fluoroplastics and Fluoroelastomers. *Integrated Environmental Assessment and Management* 19(2): 326-354. <https://setac.onlinelibrary.wiley.com/doi/10.1002/ieam.4646>



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