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Siloxane

Siloxanes are a functional group of polymers in which the chains are formed from alternating silicon and oxygen atoms. The backbones can be branched or unbranched. They are very common and are considered to be among the most important organosilicon polymers used in polymer chemistry. An example is polydimethylsiloxane (PDMS), which is clear, inert, non-toxic, and non-flammable. It is considered the most widely used silicon based-organic polymer.

Siloxanes can be made through two processes. The first is step-growth polymerization, a type of polycondensation. The second method is ring-opening copolymerization. Polydimethylsiloxane can be manufactured with various degrees of viscosity, ranging from a thin pourable liquid to a thick rubbery semi-solid.

The properties of siloxanes are varied and abundantly useful. These properties include flexibility, permeability to gases, low glass transition temperature, low boiling point, low surface energy, and low surface tension. Of these properties the most important to my research during the FMRI/RET is the permeability to gases. In our experiment we tested the sorption levels of organic vapors of polymers and PDMS was among the polymers we sampled.

Siloxanes are widely used and have application in the medical and non-medical fields. Medical uses include prostheses, artificial organs, facial reconstruction, catheters, artificial skin, contact lenses, and drug delivery systems.

In the nonmedical arena siloxanes have a multitude of uses. They are high-performance elastomers, membranes, electrical insulators, water repellants, anti-foaming agents, mold release agents, adhesives and protective coatings, release control agents for agricultural chemicals, and hydraulic, heat-transfer, and dielectric fluids. Their hydrophobic nature makes them excellent water repellants. They are also used in protective coatings, adhesives, and dry cleaning agents.

PDMS is an additive in cooking oils, cosmetics deodorants, treatment for head-lice and Silly Putty.

For the most part it is believed that siloxanes are safe with no adverse effects and low bioaccumulation when they are used correctly. However, several small molecule siloxanes are being investigated as potentially harmful.

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