

APPENDIX – 聚合物/金屬 一般屬性

Properties of Polymers

CTFE

Chlorotrifluoroethylene, is the generic name for the material produced as Kel-F[®] and as Aclar[®]. It is very resistant to all chemicals except THF and some halogenated solvents, and is resistant to all inorganic corrosive liquids, including oxidizing acids. CTFE can be used at temperature up to 100°C. Swells in ketones.

ETFE

Ethyltrifluoroethylene is the generic name for the material such as Tefzel[®]. A fluoropolymer used for sealing surfaces, it is resistant to most chemical attack; however, some chlorinated chemicals will cause a physical swelling of ETFE tubing.

FEP

Fluorinated ethylene propylene is another member of the fluorocarbon family with similar chemical properties. It is generally more rigid than PTFE, with somewhat increased tensile strength. It is typically more transparent than PTFE, slightly less porous, and less permeable to oxygen. FEP is not as subject to compressive creep at room temperature as PTFE, and because of its slightly higher coefficient of friction is easier to retain in a compression fitting.

PEEK

Considered relatively inert and biocompatible, polyether-etherketone tubing can withstand temperatures up to 100 °C. Under the right circumstances, .005" - .020" ID tubing can be used up to 5000 psi for a limited time, and .030" to 3000 psi. Larger IDs are typically good to 500 psi.

These limits will be substantially reduced at elevated temperatures and in contact with some solvents or acids.

Its mechanical properties allow PEEK to be used instead of stainless in many situation and in some environments where stainless would be too reactive.

However, PEEK can be somewhat absorptive of solvents and analytes, notably methylene chloride, DMSO, THF, and high concentrations of sulfuric and nitric acid. This tubing is highly prone to "kinking", or sealing off, if held in a sharp bend over time.

PFA

Perfluoroalkoxy is a fluorocarbon with chemical and mechanical properties similar to FEP. More rigid than either PTFE or FEP. Commonly used for injection molded parts.

PPS

Polyphenylene sulphide is the generic name for the material produced as Fortron[®], Ryton[®], and others. It is very resistant to all solvents, acids, and bases.

PTFE

Polytetrafluoroethylene is the generic name for the class of materials such as Teflon[®]. It offers superior chemical resistance but is limited in pressure and temperature capabilities. Because it's so easy to handle, it is often used in low pressure situations where stainless steel might cause adsorption. PTFE tubing is relatively porous, and compounds of low molecular weight can diffuse through the tubing wall.

Polypropylene

Widely used polymer for non-wetted parts. Attacked by strong oxidizers, aromatic and chlorinated hydrocarbons.

PVDF

PVDF, polyvinylidene fluoride, has excellent resistance to most mineral and organic acids, aliphatic and aromatic hydrocarbons, and halogenated solvents. Poor resistance to acetone, MEK, THF, and potassium and sodium hydroxid. Often supplied as Kynar[®].

Properties of Metals

Stainless steel, type 316

This is the standard tubing material for chromatography, suitable for a wide variety of applications. It is cold drawn seamless, not welded, with close tolerances held on both ID and OD. We neither recommend nor offer Type 304 stainless steel for analytical applications.

Austenitic stainless steels may be used for most chromatographic applications. Type 316 is most commonly used for HPLC because of its superior chloride ion resistance.

Stainless steel , type 303

Recommended for GC use and general purpose connections. It combines excellent machining characteristics with good resistance to corrosion and high temperature oxidation. However, it is susceptible to attack by chlorides, iodides, and bromides.

Titanium

Although it is more difficult to machine than common alloys containing aluminum and vanadium, Valco uses Grade 2 pure titanium in order to avoid possible contamination of the sample stream with these metals. Good for organic and inorganic salts except aluminum and calcium chlorides, and all alkalis except boiling concentrated potassium hydroxide.

Good with dilute, low temperature formic, lactic, sulfuric, hydrochloric, and phosphoric acids, but rapidly attacked by hydrofluoric acid. Good with dilute nitric acid at low temperatures; corrodes at high concentrations and temperatures. Can ignite with fuming nitric acid. Attacked by oxalic acid, concentrated phosphoric acid, hot trichloroacetic acid, and zinc chloride.