FEP (Fluorinated Ethylene Propylene)

General information

Overview

The addition of hexafluoropropylene gives thermoplastic processability. When introduced, there was not a great demand for a melt processable PTFE alternative; and for conventional plastics fabricators, machinery had to be modified due to the high melt viscosity.

Strengths

Lower melt viscosity and higher impact resistance than PTFE. Comparable high chemical and UV resistance, low flammability, and good electrical properties to PTFE. Generally very high impact strength, transparent.

Limitations

Lower stiffness, strength, and long-term maximum service temperature compared with PTFE (one of the lowest stiffnesses and strengths of all fluoroplastics - now surpassed by THV). Relatively high melt viscosity limits filler content. Around twice as expensive as PTFE, very poor wear resistance and poor friction, low heat distortion temperature.

Tradenames

Dyneon FEP, Hostaflon FEP, Teflon FEP

Typical uses

Valves, electrical components, and equipment for chemical

Composition overview

Compositional summary

Polytetrafluoroethylene, PTFE (-C2F4-)n, copolymerized with hexafluoropropylene, (-C3F6-)m.

Material family	Plastic (thermoplastic, semi-crystalline)
Base material	FEP (Fluorinated ethylene propylene)
CAS number	25067-11-2

Effect of composition

Graphite and glass fibers used as reinforcing agents to increase stiffness and wear

Processing properties

Feedstocks & production

PTFE, hexafluoropropylene

First commercial production	1956

Forming

High temperatures (melt temperatures of 315-360 °C (600-680 °F) and mold temperatures of 200-230 °C (390-450 °F)). Injection molding, extrusion, extrusion blow-molding. Barrels of processing machines must be made of iron-free alloys. FEP is susceptible to melt fracture. Vortex sintering with FEP powder also possible. Very poor shrinkage on cooling. Rotational molding difficult.

Machining

Poor machinability.

Joining

Suitable for friction, hot gas, and hot plate welding. Difficult to weld ultrasonically. Very difficult to bond - no adhesives tested provide a suitable bond. As with other fluoropolymers, hazardous fumes are released on welding, so breathing apparatus is recommended.

Surface treatment

Not suitable for

Notes

Warning

When processing fluoropolymer resins, the temperatures reached will cause some decomposition, with more at higher temperatures. For FEP there is measurable decomposition above 330 °C (630 °F). Overexposure to the fumes will in general produce influenza like symptoms and shaking. At or above 450 °C (840 °F) carbonyl fluoride and hydrogen fluoride are the main gases produced. Above 475 °C (890 °F) perfluoroisobutylene is produced in small quantities (gas production temperatures are for PTFE and so may be lower for fluoropolymers that start decomposing at lower temperatures).