

## PCTFE Sheet, Rod & Films

### Property

Product Name: PCTFE.  
Chemical Name and Synonym: Polychlorotrifluoroethylene.

### Material Names

Neoflon PCTFE from Daikin, Voltalef from Arkema ,Aclon from Allied Signal.

### PCTFE

Polychlorotrifluoroethylene (PCTFE or PTFCE) is a thermoplastic chlorofluoropolymer with the molecular formula  $(CF_2CClF)_n$ , where n is the number of monomer units in the polymer molecule. It is similar to polytetrafluoroethene (PTFE), except that it is a homopolymer of the monomer chlorotrifluoroethylene (CTFE) instead of tetrafluoroethene. It has the lowest water vapor transmission rate of any plastic.

PCTFE is an addition homopolymer. It is prepared by the free-radical polymerization of chlorotrifluoroethylene (CTFE) and can be carried out by solution, bulk, suspension and emulsion polymerization.

PCTFE has high tensile strength and good thermal characteristics. It is nonflammable and the heat resistance is up to 175 °C. It has a low coefficient of thermal expansion. The glass transition temperature (T<sub>g</sub>) is around 45 °C.

PCTFE has one of the highest limiting oxygen index (LOI). It has good chemical resistance. It also exhibits properties like zero moisture absorption and non wetting.

It does not absorb visible light. When subjected to high-energy radiation, it undergoes degradation like PTFE. It can be used as a transparent film.

The presence of a chlorine atom, having greater atomic radius than that of fluorine, hinders the close packing possible in PTFE. This results in having a relatively lower melting point among fluoropolymers, around 210–215 °C.

PCTFE is resistant to the attack by most chemicals and oxidizing agents, a property exhibited due to the presence of high fluorine content. However, it swells slightly in halocarbon compounds, ethers, esters and aromatic compounds. PCTFE is resistant to oxidation because it does not have any hydrogen atoms.

PCTFE exhibits a permanent dipole moment due to the asymmetry of its repeating unit. This dipole moment is perpendicular to the carbon-chain axis.

### Applications

PCTFE finds majority of its application due to two main properties: water repulsion and chemical stability. PCTFE films are used as a protective layer against moisture. These include:

moisture barrier in pharmaceutical blister packaging, water-vapour barrier for protecting phosphor coatings in electroluminescent lamps (the phosphor chemicals are sensitive to moisture), protection of liquid-crystal display (LCD) panels, which are sensitive to moisture, cryogenic seals and composites. Due to its chemical stability, it acts as a protective barrier against chemicals. It is used as a coating and prefabricated liner for chemical applications. PCTFE is used to protect sensitive electronic components because of its excellent electrical resistance and water repulsion. Other uses include flexible printed circuits and insulation of wires and cables.

Jiangxi Beluns Plastics Co., Ltd. is a professional manufacturer of high performance plastics, fluoroplastics and general engineering plastics such as plates, bars, films and various special-shaped parts. The raw materials for plastic products can be processed according to the brand type specified by the customer. Extrusion, molding, turning, cnc processing are our main processing types. Products made from each material have different uses. Please contact us to select the appropriate plastic material for processing. Some of the data comes from the Internet, Understand if something is wrong.

Low-molecular-weight PCTFE waxes, oils and greases find their application as inert sealants and lubricants. They are also used as gyroscope flotation fluids and plasticizers for thermoplastics.

The cryogenic and liquid gas sector uses mainly PCTFE seals for their sealing solution as this material has low gas absorption and resist to temperature below 200 °C.

- Cryogenic and chemical processing components
- Seals and gaskets
- Aerospace valve seats, pump parts, impellers, diaphragms and plugs
- Laboratory instruments
- Nuclear service / high radiation exposure
- Liquid oxygen and liquid nitrogen valve linings

#### **PCTFE PRODUCT BENEFITS**

- Dimensionally stable, rigid, and resistant to cold flow
- Very low gas permeation and outgassing
- Near zero moisture absorption
- Excellent chemical resistance
- High compressive strength
- Low deformation under load
- Non-flammable
- Temperature range: -400°F to +380°F
- Radiation resistance

#### **Differences from PTFE**

PCTFE is a homopolymer of chlorotrifluoroethylene (CTFE), whereas PTFE is a homopolymer of tetrafluoroethylene. The monomers of the former differs from that of latter structurally by having a chlorine atom replacing one of the fluorine atoms. Hence each repeating unit of PCTFE have a chlorine atom in place of a fluorine atom. This accounts for PCTFE to have less flexibility of chain and hence higher glass transition temperature. PTFE has a higher melting point and is more crystalline than PCTFE, but the latter is stronger and stiffer. Though PCTFE has excellent chemical resistance, it is still less than that of PTFE. PCTFE has lower viscosity, higher tensile strength and creep resistance than PTFE.

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