

## Generic variation of Teflon and uses in plastic lab tubing - Primer

*Date: 24-AUGUST-2013 Last Updated: 19-JUNE-2025*

Teflon® is a registered trademark of E.I. du Pont de Nemours and Company (DuPont) and refers to a family of fluoropolymer materials known for their exceptional chemical resistance, thermal stability, and low friction. In laboratory settings, different types are used in tubing, each offering unique properties suited to specific applications. Below is a primer on the most common generic variants used in plastic laboratory tubing:

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### 1. PFA (Perfluoroalkoxy Alkane)

- **Key Properties:**
    - Exceptional chemical resistance and purity
    - Very low coefficient of friction
    - Translucent, allowing visibility of contents
    - Excellent flexibility and long service life
  - **Temperature Range:** -270°C to 260°C
  - **Applications:** Ideal for high-purity applications such as chromatography, semiconductor processing, and pharmaceutical manufacturing.
  - **Notes:** PFA is preferred over FEP in applications involving repeated heating. However, it is more susceptible to water absorption and weathering.
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### 2. PTFE (Polytetrafluoroethylene)

- **Key Properties:**
    - Extremely low friction surface
    - High chemical and thermal resistance
    - Hydrophobic and non-stick
    - Cannot be easily injection molded; must be machined
  - **Temperature Range:** -70°C to 260°C
  - **Applications:** Used in applications where chemical inertness and non-stick properties are critical, such as seals, gaskets, and custom labware.
  - **Notes:** PTFE is the original Teflon®, discovered by Roy Plunkett in 1938. Due to its high melt point and cold flow characteristics, it is more expensive to fabricate.
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### 3. FEP (Fluorinated Ethylene Propylene)

- **Key Properties:**
  - Similar chemical resistance to PTFE and PFA
  - Better impact strength
  - Can be injection molded, reducing cost
  - Translucent and moderately flexible
- **Temperature Range:** -270°C to 200°C
- **Applications:** Common in tubing and containers where moderate flexibility and chemical resistance are needed.

- **Notes:** FEP is more resistant to weathering and water absorption than PFA, but has a lower melting point and is less suitable for repeated high-heat exposure.
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#### 4. ETFE (Ethylene Tetrafluoroethylene)

- **Key Properties:**
    - Not a true Teflon® product, but a fluoropolymer with similar traits
    - Good chemical resistance and mechanical strength
    - Moldable and cost-effective
    - Excellent impact resistance
  - **Temperature Range:** Typically up to 150°C
  - **Applications:** Used in labware and tubing where durability and affordability are important.
  - **Notes:** ETFE is often chosen for its balance of performance and cost, especially in applications where extreme chemical resistance is not the primary concern.
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### Choosing the Right Material for Your Application

When selecting a Teflon® material for lab tubing or containers, consider:

- **Chemical compatibility**
- **Temperature exposure**
- **Mechanical stress and flexibility needs**
- **Visibility of contents**
- **Budget constraints**

Each variant offers a unique balance of properties, making it important to match the material to the specific demands of your application.

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