Module: 4
Viton® - Selection Guide
Monomers used in Viton®

- **VF₂**
  - H₂C=CF₂ (59% fluorine)
  - Vinylidene fluoride

- **HFP**
  - F₂C=CF-CF₃ (76% fluorine)
  - Hexafluoropropylene

- **TFE**
  - F₂C=CF₂ (76% fluorine)
  - Tetrafluoroethylene

- **PMVE**
  - F₂C=CF-O-CF₃ (69% fluorine)
  - Perfluoro (methyl-based vinyl) ether

- **E**
  - H₂C=CH₂
  - Ethylene

- **P**
  - H₂C=CH-CH₃
  - Propylene

Viton® is a registered trademark of DuPont Performance Elastomers.
Viton® Types Monomer Composition

Viton® is a registered trademark of DuPont Performance Elastomers.

Viton® Types

<table>
<thead>
<tr>
<th>Monomer Composition</th>
<th>Standard Viton®</th>
<th>Specialty Viton®</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF₂</td>
<td>HFP</td>
<td>TFE</td>
</tr>
<tr>
<td>HFP</td>
<td>TFE</td>
<td>PMVE</td>
</tr>
<tr>
<td>TFE</td>
<td>PMVE</td>
<td>P</td>
</tr>
<tr>
<td>PMVE</td>
<td>P</td>
<td>E</td>
</tr>
<tr>
<td>P</td>
<td>E</td>
<td>CSM*</td>
</tr>
</tbody>
</table>

* Cure Site Monomer (composition depends on polymer)
Fluoroelastomers
based on VF₂, HFP and TFE

Viton® A, B, F, GBL-S, GF-S fluoroelastomers

Using PMVE instead of HFP can give polymers with Tg about 15°C lower (e.g. GLT-S, GBLT-S, GFLT-S) Fluoroelastomer design - balancing fluid resistance and Tg


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Monomer Composition Impacts

- Chemical resistance
- Low temperature properties
Viton® Polymer Types

- **Standard Viton®**
  - «A» family
    - 66% Fluorine
  - «B» and «GBL-S» families
    - 68% Fluorine
  - «F» and «GF-S» families
    - 70% Fluorine
    - Most Fluid Resistant

- **Specialty Viton® (Low Temperature)**
  - «GLT-S» family
    - 64% Fluorine
  - «GBLT-S» family
    - 66% Fluorine
  - «GFLT-S» family
    - 67% Fluorine

- **Specialty Viton® Extreme™**
  - TBR-S, 60% Fluorine
  - ETP-S, 67% Fluorine

- **Improving Chemical Resistance**
  - Increasing Fluorine
  - Decreasing Hydrogen

*LT stands for Low Temperature

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# Viton® Relative Performance

## Standard Products

<table>
<thead>
<tr>
<th>Viton® product</th>
<th>A</th>
<th>B</th>
<th>F</th>
<th>GBL-S*</th>
<th>GF-S*</th>
<th>GLT-S*</th>
<th>GBLT-S*</th>
<th>GFLT-S*</th>
<th>TBR-S*</th>
<th>ETP-S*</th>
</tr>
</thead>
</table>

## Specialty Products

<table>
<thead>
<tr>
<th></th>
<th>Extrem™</th>
<th>Extrem™</th>
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<tbody>
<tr>
<td>Curing system</td>
<td>bisphenol</td>
<td>bisphenol</td>
</tr>
<tr>
<td>Fluorine content</td>
<td>66%</td>
<td>68.5%</td>
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</table>

## Heat resistance

- All Viton® products have outstanding thermal properties

## Chemical resistance*  

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<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>BEST</th>
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## Base resistance

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<th>X</th>
<th>O</th>
<th>O</th>
<th>O</th>
<th>BEST</th>
<th>BEST</th>
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</table>

## Low temperature properties

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<th>BEST</th>
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</table>

## Compression set resistance

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</tr>
</thead>
</table>

## Relative cost of polymer

|               | low | low | low | low | low | medium | medium | medium | low | high |

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* BEST: Excellent   ○○: Very good ○ Good ○ Fair ○ poor

* "S" indicates products made with Advanced Polymer Architecture

** Consult the Chemical Resistance Guide at www.dupontelastomers.com or contact your Viton® specialist.
Viton® Polymers and Typical Applications

**High fluorine for best chemical resistance**
(e.g., steam and acid)

**Broadest fluid resistance**
(e.g., down hole)

**High fluorine with low temperature functionality**
(e.g., fuel systems)

**Best fluid resistance**

**Best compression set and processing**

**Easy processing**
low fluorine
(e.g., standard o-rings)

**BestLow temperature performance**
(e.g., fuel injector o-rings)

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**Volume swell upon immersion in M15 / 7 d / room-temperature (%)**
Fuel M15 composition: 85% Fuel C and 15% Methanol

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**red** for Viton® made with APA (« -S » for APA technology)

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APA Polymers
and Typical Market Segments

Fuel Transportation (Automotive)
- Lower permeation
- Longer seal life

Oil & Gas
- Superior/Broad chemical resistance
- Explosive decompression

Automotive
- New fuel generations
- Lower temperature

Chemical Process Industry
- More heat
- Lower maintenance

Aerospace
- Extreme temperatures
- Aviation lubricants leak free

Best chemical and fuel resistance

Volume swell after 7 days at room temperature in M15 (%)
Viton® made with APA
Application Guide is on the Internet
www.dupontelasomers.com/Products/VitonAPA/apaMatrix.aspx
The Viton® Selection Guide is on the Internet
http://www.dupontelastomers.com/Products/Viton/selectionGuide.asp

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Selection Based on Application Needs

**Base resistance:** Best resistance to aggressive amine based anti-corrosion additives?

**YES**
- Hydrocarbon resistance (automotive fuels, etc.)?
  - **YES**
    - ETP-S
  - **NO**
    - TBR-S
- GFLT-S

**NO**
- High resistance to oxygenated-fuels (MeOH, MTBE), steam, acids?
  - **YES**
    - Low temperature flexibility better than -20°C?
      - **YES**
        - GFLT-S
      - **NO**
        - F
  - **NO**
    - Low temperature flexibility better than -20°C?
      - **YES**
        - GFLT-S
      - **NO**
        - GLT-S

**red** for Viton® made with APA (« -S » for APA technology)

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For other medical applications, discuss with your DuPont Performance Elastomers customer service representative and read Medical Caution Statement H-69237.

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