Better Pharmaceutical and Biotech Processing with Teflon®

- Superior purity
- Fast process validation
- Resistance to biofilm buildup
- Faster, easier cleaning
- Near universal chemical resistance
Protect Product Purity, Improve Cleanability With DuPont™ Teflon®

The broad chemical compatibility and resistance to biofilm buildup of Teflon® allow you to protect quality and increase productivity

Pharmaceutical and biotechnology engineers are facing new design challenges. Today, manufacturing equipment has to meet demands for increased product purity, easier cleanability, improved durability and low maintenance costs.

To meet these requirements, engineers are beginning to turn to piping, components and vessels with wetted surfaces of DuPont Teflon® fluoropolymer resins. They often outperform traditional materials such as stainless steel or glass by reducing maintenance, increasing uptime and throughput, safeguarding product purity and allowing equipment to make a wider range of products. Part costs are far lower than those of exotic alloy components.

Cynergy™ tubing and components rely on Teflon® PFA HP for all wetted surfaces to protect process purity. Manufacturer: Entegris, Inc.

Chemical Resistance for Assured Purity

With its unmatched chemical resistance, Teflon® is suitable for just about any pharmaceutical or biochem process. Because its fully fluorinated molecules form continuous non-reactive surfaces, Teflon® outperforms other types of polymers. Because of its near-universal chemical resistance (see below), you can use equipment made with Teflon® to produce a wider range of products without concerns about compatibility.

Because Teflon® is so chemically non-reactive, there are no byproducts of corrosion to contaminate products. What’s more, Teflon® is extremely pure, with part-per-billion ion extraction levels, an important consideration for metal-sensitive processes.

Most grades of Teflon® PTFE and Teflon® FEP may be used in food contact applications in compliance with the U. S. Federal Food and Drug Administration’s (FDA) Regulation 21 CFR 177.1550. Teflon® PFA 440 HP and 450 HP also comply. For detailed information, call DuPont at (302) 479-7731 and ask for a copy of our bulletin about DuPont fluoropolymers used in applications regulated by the Food and Drug Administration, H-22779-5.

Steel vessel has corrosion-resistant lining of Teflon® PTFE. Sheet lining installer: Entegris, Inc.
Easier Cleaning

Equipment with Teflon® stays cleaner during use, and cleaning takes less time and effort than with conventional materials. Nothing sticks very well to Teflon®, not even the most adhesive biological products.

Surfaces of Teflon® are smooth and non-wetting, and they resist biofilm buildup. The strongest, fastest-working cleaning solutions can be used with Teflon®.

What’s more, piping and components can be designed for steam-in-place processes, which isn’t possible with most plastics.

Tests show that when biofilm does accumulate, it is far easier to remove from Teflon® than from stainless steel and several other materials. (See table at right).

Biofilm removal, percent, in virtually quiescent dilute sodium hypochlorite — reported by the BioProcess Technical Institute, University of Minnesota

<table>
<thead>
<tr>
<th>Commercial substrate</th>
<th>K. pneumonia, %</th>
<th>S. Cholera suis, %</th>
<th>E. Coli, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel (elee. Polished)</td>
<td>67</td>
<td>25</td>
<td>56</td>
</tr>
<tr>
<td>Polypropylene</td>
<td>67</td>
<td>75</td>
<td>75</td>
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<tr>
<td>Borosilicate glass</td>
<td>89</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Silicone-coated glass</td>
<td>89</td>
<td>89</td>
<td>78</td>
</tr>
<tr>
<td>Polyvinylidene fluoride</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Teflon® PFA</td>
<td>99</td>
<td>99</td>
<td>98</td>
</tr>
</tbody>
</table>

Cleaning agent: Dilute sodium hypochlorite, virtually quiescent. Source: BioProcess Technical Institute, University of Minnesota

Fights biofilm buildup. Surfaces of Teflon® resist the onset of biological films because Teflon® is not easily wetted (see diagram below) and is not subject to biological or chemical attack.

Contact angles in degrees with water show Teflon® is far less wettable than stainless steel or glass.

Hose of Teflon® PTFE with stainless steel overbraid for high pressure applications and fabric cover has clamp-type sanitary fittings. Manufacturer: Crane Resistoflex.

No Absorption of Preservatives

When they’re made with Teflon®, systems for handling preservatives needn’t be drained during maintenance shutdowns because Teflon® doesn’t absorb or react with preservatives. With some materials, preservative solutions can be weakened over time due to absorption of their components, so it may be necessary to drain systems during relatively brief shutdowns.

In laboratory tests with dilute solutions, tubing of Teflon® did not absorb methyl and propyl parabens, benzoic acid, sorbic acid, benzyl alcohol and benzalkonium chloride. Food-grade silicone rubber and PVC tubing absorbed significant amounts.

Absorption of Propyl Parabens Preservative
Off-the-Shelf or Custom Components

Piping, valves, pumps, other components for fluid handling systems and vessels with wetted surfaces of Teflon® are available in a wide range of sizes and styles. Systems with Teflon® can cost about the same as those made with ordinary materials.

Depending on the resin type, Teflon® can be melt extruded, rotationally molded, injection molded or formed by compression and sintering. Virtually any custom component can be formed with well-established technologies.

We’re Ready to Help

DuPont is eager to help you gain the benefits of Teflon® in manufacturing pharmaceuticals. In the U.S., call 302-479-7731. In other countries, contact the nearest location listed on the back. For instant information, visit www.teflon.com/pharma on the Internet.