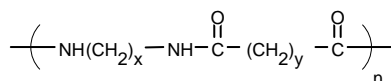


# Applications

## Engineering Polymers

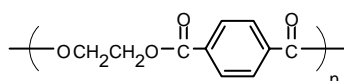
Engineering polymers are materials with exceptional mechanical properties such as stiffness, toughness, and low creep that make them valuable in the manufacture of structural products like gears, bearings, electronic devices, and auto parts.<sup>1-3</sup> Typical engineering plastics include acetals, polyamides, poly(amide-imide)s, polyarylates, polycarbonates, polyesters, poly(ether etherketone)s, poly(ether-imide)s, polyimides, poly(phenylene oxide)s, poly(phenylene sulfide)s, and polysulfones.<sup>4</sup> Aldrich offers polymers in all these classes. Representative examples are shown below.



1

**Polyamides** are crystalline and have good impact strength, toughness, and abrasion resistance. Eighteen different aliphatic and aromatic polyamides are available. Stabilizers and lubricants are present in some of these products.

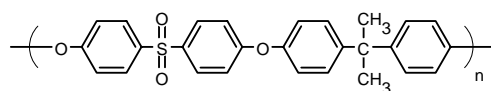
<a href="#">44,299-2</a>	<b>Nylon 4/6 (1)</b>	<b>250g ; 1kg</b>
<a href="#">42,916-3</a>	<b>Nylon 6/6 (Zytel® 101L nylon resin) (1)</b>	<b>250g ; 1kg ; 5kg</b>
<a href="#">18,806-9</a>	<b>Nylon 6/9 (1)</b>	<b>100g ; 250g</b>
<a href="#">42,927-9</a>	<b>Nylon 6/12 (Zytel® 158 nylon resin) (1)</b>	<b>250g ; 1kg ; 5kg</b>
<a href="#">42,924-4</a>	<b>Nylon 6/66 (Zytel® 109L nylon resin) (1)</b>	<b>250g ; 1kg ; 5kg</b>
<a href="#">18,116-1</a>	<b>Nylon 12</b>	<b>5g ; 250g</b>
<a href="#">44,652-1</a>	<b>Poly[N,N'-(1,3-phenylene)isophthalamide]</b>	<b>100g ; 500g</b>



2

**Polyesters** are often used with fillers like fiberglass, mica, and minerals to increase strength and stiffness.

<a href="#">42,925-2</a>	<b>Poly(ethylene terephthalate) (Rynite® 530 polyester resin), 30% glass reinforced (2)</b>	<b>250g ; 1kg ; 5kg</b>
<a href="#">42,926-0</a>	<b>Poly(ethylene terephthalate) (Rynite® FR530 polyester resin), 30% glass reinforced with added fire retardant (2)</b>	<b>250g ; 1kg ; 5kg</b>
<a href="#">20,025-5</a>	<b>Poly(ethylene terephthalate) (2)</b>	<b>5g ; 250g ; 500g</b>
<a href="#">43,514-7</a>	<b>Poly(1,4-butylene terephthalate), melt index 20</b>	<b>250g ; 1kg</b>
<a href="#">43,515-5</a>	<b>Poly(1,4-butylene terephthalate), melt index 50</b>	<b>250g ; 1kg</b>
<a href="#">43,533-3</a>	<b>Poly(1,4-cyclohexanedimethylene terephthalate-co-ethylene terephthalate)</b>	<b>1kg</b>

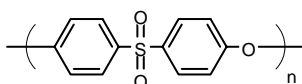


3

**Sulfone**-containing polymers show high resistance to acids and alkalis.

These thermally stable polymers are used in electronic connectors, circuit boards, sterilizable items, and appliance covers.<sup>5</sup>

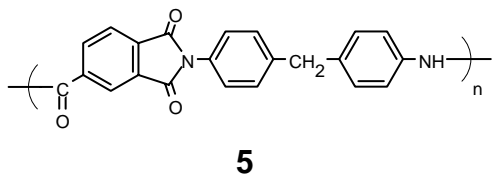
<a href="#">42,830-2</a>	<b>Polysulfone, <math>M_n</math> ca. 16,000 (3)</b>	<b>5g ; 100g ; 500g</b>
<a href="#">18,244-3</a>	<b>Polysulfone, <math>M_n</math> ca. 22,000 (3)</b>	<b>5g ; 250g ; 500g</b>
<a href="#">37,429-6</a>	<b>Polysulfone, <math>M_n</math> ca. 26,000 (3)</b>	<b>20g ; 200g ; 1kg</b>
<a href="#">18,245-1</a>	<b>Polysulfone, secondary standard, typical <math>M_w</math> 67,000 (3)</b>	<b>25g</b>
<a href="#">19,109-4</a>	<b>Poly(1,4-phenylene ether-sulfone), melt index 75 (4)</b>	<b>50g ; 250g</b>
<a href="#">44,097-3</a>	<b>Poly(1,4-phenylene ether-ether-sulfone), powder</b>	<b>250g ; 1kg</b>
<a href="#">44,096-5</a>	<b>Poly(1,4-phenylene ether-ether-sulfone), pellets</b>	<b>250g ; 1kg</b>



4

# Applications

## Engineering Polymers (continued)



Polyimides have outstanding thermal properties.

<a href="#">30,979-6</a>	<b>Polybenzimidazole</b>	<b>5g ; 25g</b>
<a href="#">42,827-2</a>	<b>Poly(trimellitic anhydride chloride-<i>co</i>-4,4' methylenedianiline) (5)</b>	<b>25g; 100g</b>
<a href="#">45,975-5</a>	<b>Poly(trimellitic anhydride chloride-<i>alt</i>-benzidine), 20 wt. % solution in NMP/xylenes</b>	<b>10mL ; 25mL</b>

Larger quantities of TSCA-listed polymers are available from [Sigma-Aldrich Fine Chemicals](#), the large-scale chemicals division of Sigma-Aldrich, Inc. Please call **800-336-9719 (USA)** or visit our Web site: [www.sigma-aldrich.com](http://www.sigma-aldrich.com) to inquire about prices and quantities.

**References:** (1) Alger, M.S.M. *Polymer Science Dictionary*, Elsevier Science: New York, 1989 (Aldrich Cat. No. [Z24,689-1](#)). (2) Seymour, R.B.; Carraher, C.E., Jr. *Polymer Chemistry: An Introduction*, 3rd ed.; Marcel Dekker: New York, 1992; p 243 (Aldrich Cat. No. [Z40,603-1](#)). (3) Odian, G. *Principles of Polymerization*, 3rd ed.; John Wiley & Sons: New York, 1991; p 100 (Aldrich Cat. No. [Z22,195-3](#)). (4) Stevens, M.P. *Polymer Chemistry: An Introduction*, 2nd ed.; Oxford University Press: New York, 1990; p 32 (Aldrich Cat. No. [Z24,576-3](#)). (5) Saunders, K.J. *Organic Polymer Chemistry*, 2nd ed.; Chapman and Hall: New York, 1988; pp 281-285.

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## Surfactants

From *Adogen*® to *Zonyl*® and everything in between, Aldrich offers over 150 different surfactants to meet your specific needs. Our wide selection includes ionic, nonionic, and zwitterionic surfactants with hydrophile-lipophile balance (HLB) values of 1.0 to >20. We now also offer the new Triton® SP-series surfactants – the splittable surfactants that cleave at low pH and cease to act as surfactants.

A brief selection is provided below. For more information and a complete listing of Aldrich surfactants, search our Web site at [www.sigma-aldrich.com](http://www.sigma-aldrich.com) or contact our Technical Services department at **800-231-8327 (USA)** or your local office, or email us: [aldrich@sial.com](mailto:aldrich@sial.com).

<a href="#">49,475-5</a>	<b>Triton® SP-135; HLB = 8</b>	<b>100mL</b>
<a href="#">49,476-3</a>	<b>Triton® SP-190; HLB = 13</b>	<b>100mL</b>
<a href="#">23,472-9</a>	<b>Triton® X-100; HLB = 13.5</b>	<b>5mL; 100mL; 500mL</b>
<a href="#">28,210-3</a>	<b>Triton® X-100, reduced</b>	<b>5g; 25g</b>
<a href="#">23,473-7</a>	<b>Triton® X-405, 70% solution in water; HLB = 17.9</b>	<b>5mL; 100mL; 500mL</b>

<a href="#">85,657-6</a>	<b>Adogen® 464</b>	<b>5mL; 100mL; 500mL</b>
<a href="#">42,053-0</a>	<b>Alkanol® XC surfactant</b>	<b>100g; 500g</b>
<a href="#">46,638-7</a>	<b>Brij® 700; HLB = 18.8</b>	<b>250g; 1kg</b>
<a href="#">27,434-8</a>	<b>Tween® 20; HLB = 16.7</b>	<b>25mL; 500mL; 4L; 18L</b>
<a href="#">27,436-4</a>	<b>Tween® 80; HLB = 15.4</b>	<b>25mL; 500mL; 4L; 18L</b>
<a href="#">42,141-3</a>	<b>Zonyl® FSN fluorosurfactant</b>	<b>50mL; 250mL</b>

<a href="#">46,330-2</a>	<b>Glycolic acid ethoxylate 4-nonylphenyl ether, average <math>M_n</math> ca. 600</b>	<b>100mL</b>
<a href="#">46,329-9</a>	<b>Glycolic acid ethoxylate 4-<i>tert</i>-butylphenyl ether, average <math>M_n</math> ca. 380</b>	<b>100mL</b>
<a href="#">46,322-1</a>	<b>Glycolic acid ethoxylate lauryl ether, average <math>M_n</math> ca. 360</b>	<b>100mL</b>
<a href="#">46,324-8</a>	<b>Glycolic acid ethoxylate lauryl ether, average <math>M_n</math> ca. 460</b>	<b>100mL</b>

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