



Thermoplastics with POLYOX™ Resins



POLYOX™ Water-Soluble Resins are nonionic, high molecular weight water-soluble poly (ethylene oxide) polymers. Molecular weights range from 100,000 to about 8,000,000. They exhibit many properties that are typical of other classes of water-soluble polymers – lubricity, binding, water retention, thickening, and film formation.

But POLYOX Resins can do even more. They're thermoplastic materials that are readily calendered, extruded, injection molded, or cast. Films of POLYOX Resins are flexible, tough, and resistant to most oils and greases. With their very high molecular weight, POLYOX Resins are viscoelastic, so their aqueous solutions can reduce spattering and misting potential. And POLYOX Resins can form association compounds with many other substances such as polystyrene, polycaprolactone, polyethylene, polypropylene and polyactides to produce unique blends and achieve a wide variety of additional, useful formulation properties.

Silky, Lubricious Feel

Moisturized POLYOX Resin surfaces exhibit a lubricity that is unmatched by other plastics. Toys, water sports equipment, razor strips, and personal care products can take advantage of this unique property.

Water Soluble

The water solubility of POLYOX Resins can be controlled over a wide range through blending with other thermoplastics. Packaging materials, personal care products, and other items manufactured from POLYOX Resins are easily disposable and environmentally friendly.

Time Release

Unique swelling properties coupled with the controlled rate of dissolution make POLYOX Resins an ideal choice for time-release formulations. Devices that provide a time-release of fragrance, colors, surfactants, reagents, etc., can be extruded using POLYOX Resins. Several pharmaceutical time-release formulations are currently based on POLYOX Resins.

Nontoxic and Degradable

POLYOX Water-Soluble Resins are nontoxic and have received FDA approvals for a number of food and drug applications. Aqueous solutions of POLYOX Resins are environmentally degradable due to oxidation and aerobic biodegradation.

Because of their many unique properties, POLYOX Resins are particularly suited for the following processes:

- Casting
- Extrusion
- Injection Molding
- Blown Film

Its many end-use applications include:

- Drag-reducing coatings on ships
- Degradable plastics
- Molded combs
- Porous dip tubes
- Seed tape
- Shaving/Razors
- Water-soluble packaging film/bags
- Water-soluble tube containers



Applications

Applications	Recommended Grades
Shaving/Razors	WSR N-80 WSR N-750 WSR-301 WSR Coagulant

POLYOX Water-Soluble Resins are supplied in a wide variety of molecular weight grades and formulated compounds in standard and NF (National Formulary)

grades. These products are supplied as white, granular powders, freely flowing and possessing a slightly ammoniacal odor.

Table 1 indicates the nominal viscosity ranges for the various POLYOX products.



Typical Physical Properties of Poly(Ethylene Oxide) Film

Property	Value
Specific gravity	1.2
Tensile strength, MPa ^a	
Machine direction	16
Transverse direction	13
Secant modulus, MPa ^a	
Machine direction	290
Transverse direction	480
Elongation, %	
Machine direction	550
Transverse direction	650
Tear strength, kN/m ^b	
Machine direction	100
Transverse direction	240
Dart impact at 50% failure, kN/m ^b	80
Release time in water, s	15
O ₂ transmission, (mol/(m•s•GPa) ^c	85.8
Melting point, °C	67
Heat-sealing capability	excellent ^d
Heat-sealing temperature, °C	71-107
Cold-crack resistance, °C	-46

^a To convert MPa to psi, multiply by 145.

^b To convert kN/m to lbf/in., multiply by 57.14.

^c To convert μmol/(m•s•GPa) to cm³•mil/(in.²•d•atm), multiply by 5.

^d Equal to low density polyethylene.

Table 1: Standard Grade POLYOX Resins

POLYOX Resins	Viscosity Range Aqueous Solution at 25°C, mPa•s
WSR N-10	12-50 (5% solution)
WSR N-80	65-115 (5% solution)
WSR N-750	600-1000 (5% solution)
WSR N-3000	2250-4500 (5% solution)
WSR-205	4500-8800 (5% solution)
WSR-1105	8800-17,600 (5% solution)
WSR N-12K	400-800 (2% solution)
WSR N-60K	2000-4000 (2% solution)
WSR-301	1650-5500 (1% solution)
WSR Coagulant	5500-7500 (1% solution)
WSR-303	7500-10,000 (1% solution)
WSR-308	10,000-15,000 (1% solution)

For more information, complete literature, and product samples, you can reach a Dow representative at the following numbers:

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