Crop Defense

# EO/PO Copolymers

## Unlock the Power of Your Formulation

**Chemistry**
- Initiator/Starter types: different functionalities
- Type of oxides: ethylene oxide (EO), propylene oxide (PO) and butylene oxide (BO)
- Polyol structures: homo, hetero or copolymer (block or random)
- Finishing techniques: from crude to full
- Catalyst removal
- Flexible monomers ratio and molecular weight

**Production Sites**
- Global

**Plant Certifications**
- cGMP Compliance (current good manufacturing practices)
- Kosher for Passover
- Halal products
- Note: not all plants have the same certificate, please check in your region with your local Dow representative

**Packaging, Presentation, & Logistics**
- Bulk (Iso-containers, FTL), IBCs and drums
- Products can be shipped to all regions

Polyalkaline glycols (PAGs) are a versatile family of organic polymers that can be extensively explored in pesticide formulations. PAGs are a very established chemistry in other applications and a chemistry that could bring a variety of polymer architectures by exploring different initiators and monomers type, orientation and ratio; generating molecules with a wide range of properties, including cloud point, water solubility, wetting power, pour point, and viscosity.

The most common and already widely used PAG chemistry in pesticides are EO/PO copolymers, polymers that can work as unique dispersant agents (bringing steric stability), with distinct water solubility and also with low-foaming properties. These type of molecules are mostly explored in Emulsifiable Concentrate (EC) and Suspension Concentrate (SC) formulations, as well as Capsule Suspension (CS), Microemulsion (ME), Emulsion, Oil in Water (EW) and Suspo-Emulsion (SE) formulas.

**Figure 1:** General PAGs Production Reaction

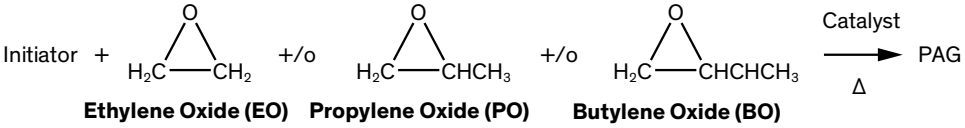
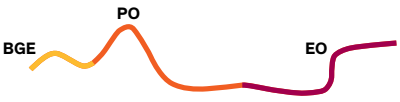


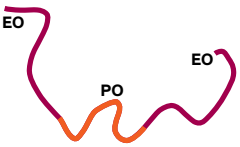

**Figure 2:** EO/PO Copolymers from Dow

**TERGITOL™ X Surfactant**




EO/PO copolymer Initiated by butyl glycol ether (BGE):
- Excellent dispersing agent
- Excellent steric stabilizer
- Water soluble
- Distinct EO/PO ratio
- Excellent emulsifier
  - Aromatic solvents
  - Chlorinated solvents

**TERGITOL™ L Surfactant**




EO/PO copolymer initiated by propylene glycol (PG):
- Readily biodegradable
- Nontoxic to aquatic oganisms
- Distinct EO/PO ratio
- Production flexibility
- Excellent foam control

| Overview of Applications | TERGITOL™ EO/PO Copolymers | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | L-61 | L-62 | L-64 | L-81 | L-101 | XD | XH | XJ |
| Emulsion & Dispersion | | | | | | ● | | ● |
| Emulsifier for Aromatic & Chlorinated Solvents | | | | | | | | ● |
| Steric & Freeze / Thaw Stabilizer | | | | | | ● | ● | ● |
| Wetting Agent | ● | ● | | | | | | |
| Foam Control | ● | ● | ● | ● | ● | | | |
| Higher Temperature (foam control) | | | ● | | | | | |
| Low Temperature (foam control) | | | | ● | ● | | | |
| Chemical Intermediates | | | | ● | ● | | | |
| Fermentation | ● | ● | ● | ● | ● | | | |

● = Readily Biodegradable

| Overview of Products | TERGITOL™ EO/PO Copolymers | | | | | | | | DOWFAX™ EO/PO Copolymers | |
|---|---|---|---|---|---|---|---|---|---|---|
| | L-61 | L-62 | L-64 | L-81 | L-101 | XD | XH | XJ | 100N50 | 100N50 Sol* |
| Cloud Point [1] | 24 | 32 | 62 | 20 | 18 | 74 | 95 | 49 | – | – |
| HLB [2] | 3 | 7 | 15 | 2 | 1 | – | – | – | 13.8 | – |
| Pour Point [3] | -32 | -2 | 7 | -20 | -24 | 34 | 40 | 27 | 45 | -10 |
| Viscosity at 38 °C (100 °F), cST | 168 | 231 | 284 | 244 | 399 | 251[6] | 319[6] | 149[6] | – | aprox. 9[6] |
| Density at 25 °C (77 °F), g/mL | 1.015 | 1.011 | 1.048 | 1.016 | 1.018 | 1.02 | 1.033 | 1.010 | aprox. 1[7] | aprox. 1[7] |
| Surface Tension [4] | 40 | 41 | 44 | 36 | 33 | 38 | 41 | 36 | 39 | 39 |
| Foam Height [5] | 0/0 | 45/30 | 48/18 | Dispersible | 30/25 | 60/25 | 80/40 | 53/13 | – | – |
| Draves 20 sec wetting conc, wt % at 25 °C (77 °F) | 0.02 | 0.50 | 1.0 | – | 0.11 | 0.38 | 0.62 | 0.24 | – | – |
| Appearance | Clear liquid | Pale yellow liquid | Opaque liquid | Pale yellow liquid | Pale yellow liquid | White solid | White solid | White solid | White solid | Clear liquid |

[1] Cloud point: °C, 1 wt % actives aqueous solution
[2] HLB Range: <10 w/o emulsifier, > 10 o/w emulsifier, 10-15 good wetting, 12-15 detergents
[3] Pour point: °C
[4] Surface tension: dynes/cm at 1% actives, 25°C
[5] Ross-Miles foam height: mm at 0.1 wt% actives, 25°C, initial/5 minute
[6] Viscosity at 25°C (77°F), cP
[7] Density at 20°C (68°F), g/mL
*18 wt % solution in water

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