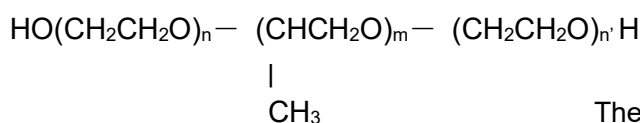

Polyoxyethylene - Polyoxypropylene Block Polymer,
Pluronic Type Nonionic Surfactants

NEWPOL PE Products

Preface

NEWPOL PE products are composed mostly of block copolymer comprising ethylene oxide (EO) and propylene oxide (PO). These products are pluronic type nonionic surfactants, which have polyoxypropylene chains in the middle of the molecular chain as a hydrophobic group, and polyoxyethylene chains at both ends of the molecules as hydrophilic groups. The structural formula is shown below.

Structural Formula



The n value is nearly equal to n'.

We offer a wide range of NEWPOL PE products in various molecular weights of polyoxypropylene chains and polyoxyethylene chains, which influences its appearance (liquid state, solid state, etc), foaming property, foam-inhibiting property, detergency, emulsifiability, dispersibility, the rate of dissolution into water, etc.

In addition, these products are available as raw materials for polyurethane resins, polyester resins, etc., because they have primary hydroxyl groups at both ends of the molecules.

We offer a wide range of NEWPOL PE products as follows:

Product Name	Number-Average Molecular Weight of Polyoxypropylene Chains	Total Number-Average Molecular Weight
NEWPOL PE-34	Approx. 1,000	Approx. 1,700
NEWPOL PE-61	Approx. 1,750	Approx. 2,000
NEWPOL PE-62	Approx. 1,750	Approx. 2,400
NEWPOL PE-64	Approx. 1,750	Approx. 3,100
NEWPOL PE-68	Approx. 1,750	Approx. 8,000
NEWPOL PE-71	Approx. 2,000	Approx. 2,200
NEWPOL PE-74	Approx. 2,000	Approx. 3,100
NEWPOL PE-75	Approx. 2,000	Approx. 3,500
NEWPOL PE-78	Approx. 2,000	Approx. 9,400
NEWPOL PE-108	Approx. 3,250	Approx. 16,000

Typical Property

1. Typical Properties

Tables 1-a and 1-b shows the typical properties of NEWPOL PE Products. The values are representative.

Table 1-a. Typical Properties

Property		NEWPOL PE-34	NEWPOL PE-61	NEWPOL PE-62	NEWPOL PE-64	NEWPOL PE-68	
Appearance (20±5 °C)		Colorless liquid	Colorless liquid	Colorless liquid	Colorless paste	White flake	
Color (hazen)		10	10	10	10	10 * ¹	
pH (1 wt % aqueous solution)		6.3	6.0	6.0	6.1	7.0	
Melting point °C		-	-	-	-	53	
Freezing point °C		-1	-30	-4	15	-	
Cloud point °C (1 wt % aqueous solution)		63	24	30	59	113 * ²	
Specific gravity (25 / 25 °C)		1.03	1.00	1.03	-	-	
Viscosity at 40 °C mPa·s		100	140	200	300	-	
Kinematic viscosity at 100 °C mm ² / s		-	-	-	-	360	
Surface tension at 20 °C mN/m	0.1 wt % aqueous solution	48.8	45.4	48.0	48.0	51.2	
	1.0 wt % aqueous solution	45.3	42.0	45.0	45.6	49.6	
Foaming * ³ property at 20 °C mm	0.1 wt % aqueous solution	Immediately	22	18	21	28	48
		After 5 min	2	0	4	7	12
	1.0 wt % aqueous solution	Immediately	24	9	25	34	53
		After 5 min	17	0	5	10	14

*1 Measured using 25 wt % aqueous solution

*2 Measured in a sealed tube

*3 Ross-Miles method (JIS)

Table 1-b. Typical Properties

Property			NEWPOL PE-71	NEWPOL PE-74	NEWPOL PE-75	NEWPOL PE-78	NEWPOL PE-108
Appearance	(20±5 °C)		Colorless liquid	Colorless paste	Colorless paste	White flake	White flake
Color	(hazen)		10	10	10	10 * ¹	10 * ¹
pH	(1 wt % aqueous solution)		6.0	6.2	6.1	7.0	7.2
Melting point	°C		-	-	-	54	57
Freezing point	°C		-30	15	17	-	-
Cloud point	°C (1 wt % aqueous solution)		21	56	69	110 * ²	105 * ²
Specific gravity	(25 / 25 °C)		1.00	-	-	-	-
Viscosity at 40 °C	mPa·s		180	450	490	-	-
Kinematic viscosity at 100 °C	mm ² / s		-	-	-	-	2,200
Surface tension at 20 °C mN/m	0.1 wt % aqueous solution		44.8	46.8	47.0	49.0	47.2
	1.0 wt % aqueous solution		42.1	45.8	45.8	46.4	45.0
Foaming * ³ property at 20 °C mm	0.1 wt % aqueous solution	Immediately	8	30	32	48	48
		After 5 min	0	7	13	12	12
	1.0 wt % aqueous solution	Immediately	5	46	45	55	53
		After 5 min	0	8	29	15	15

*1 Measured using 25 wt % aqueous solution

*2 Measured in a sealed tube

*3 Ross-Miles method (JIS)

Features and Applications

1. Features

NEWPOL PE products have the following features:

- Exhibit surface activity even in acidic, alkaline, or metallic salt solutions because these products are nonionic surfactants and do not hydrolyze due to their polyether types.
- Have a relatively low foaming property among nonionic surfactants, and the foam is washed out easily with water.
- Dissolve in water at any concentration when the solution is below the cloud point.
- NEWPOL PE-68, PE-78 and PE-108 are solid at ambient temperature (20±15 °C) and can be mixed with powdered detergents because of their low hygroscopic properties.
- NEWPOL PE-34, PE-61, PE-62, PE-64, PE-71, PE-74 and PE-75 are applicable to metal cleaners because of their low foaming properties.
- Practically noncorrosive to metals, and exhibit corrosion resistance for steel plates when used in acid cleaning.

2. Applications

2-1) Raw Materials for detergents

These products are applicable to laundry detergents, detergents for furniture, dishwasher detergents, detergents for automobiles, and fragrant toilet cleaners.

The formula for dishwasher detergents is shown below.

Formula for Dishwasher Detergents:

	wt %
NEWPOL PE-62:	2
Sodium Metasilicate:	20
Sodium sulfate:	50
Sodium carbonate:	27.9
Carboxymethyl cellulose:	0.1
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Total:	100

2-2) Agent materials in the textile industry

These products are applicable as scouring agents, spin finish for chemical and synthetic fibers, antistatic agents, and desizing agents.

2-3) Detergent raw materials for mechanical and metal parts

These products are applicable as raw materials for acid-cleaning detergents, alkali-cleaning detergents, electrolytic cleaning detergents, and spray cleaning detergents.

The following tables show the evaluation results of corrosion resistance of steel plates in hydrochloric acid or sulfuric acid baths containing NEWPOL PE products, and an example of the formula for immersion alkali-cleaning detergents.

Table 2. Corrosion Resistance of Polished Steel Plates in a Hydrochloric Acid Bath

Surfactant		Corrosion Rate $\text{g} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$	Corrosion Resistance %
Product Name	Additive Amount wt %		
NEWPOL PE-61	0.05	14.1	65.6
NEWPOL PE-64	0.05	14.4	64.9
NEWPOL PE-68	0.05	15.5	62.2
Sodium lauryl sulfate	0.05	23.2	43.4
None (Control)		41.0	-

Testing method:

Polished steel plates (4 mm×30 mm×50 mm) were immersed in a 15 wt % hydrochloric acid bath at 40 °C for 6 hours.

Table 3. Corrosion Resistance of Polished Steel Plates in a Sulfuric Acid Bath

Surfactant		Corrosion Rate $\text{g} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$	Corrosion Resistance %
Product Name	Additive Amount wt %		
NEWPOL PE-61	0.05	21.0	85.5
NEWPOL PE-64	0.05	15.0	89.7
Sodium lauryl sulfate	0.05	109.0	24.8
Sodium dodecylbenzenesulfonate	0.05	90.0	37.9
None (Control)		145.0	-

Testing method:

Polished steel plates (4 mm×30 mm×50 mm) were immersed in a 20 wt % sulfuric acid bath at 60 °C for 6 hours.

Formula for immersion alkali-cleaning detergents:

	wt %
NEWPOL PE-62:	6
Sodium metasilicate:	32
Sodium phosphate:	20.5
Soda ash:	14
Sodium hydrogencarbonate:	11.5
LAS* (active ingredient : 60 wt %):	16
Total:	100

* Sodium linear alkylbenzenesulfonate

2-4) Emulsifiers and dispersants

These products are applicable as emulsifiers for emulsion polymerization, emulsion stabilizers and pigment dispersants for latex paints, emulsifiers for silicone, and agricultural emulsifiers, etc. When used as emulsifiers for emulsion polymerization of vinyl acetate, a mixture of NEWPOL PE-64 and PE-68 imparts excellent stability and fluidity to resin emulsion, without protective colloid. The following are examples of formulas as emulsifiers for emulsion polymerization, and an emulsion stabilizer or a pigment dispersant for latex paints.

Formula for emulsifiers for emulsion polymerization:

	wt %
Vinyl acetate monomer:	50
Potassium persulfate:	0.3
NEWPOL PE-64:	2.5
NEWPOL PE-68:	2.5
Water:	44.7
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Total:	100

Formula for latex paints:

	wt %
Polyvinyl acetate:	10
NEWPOL PE-68 (20 wt % aqueous solution):	0.5
Carboxymethyl cellulose (5 wt % aqueous solution):	16.5
K ₂ CO ₃ (50 wt % aqueous solution):	0.01
Pigment:	72.99
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Total:	100

2-5) Additives for synthetic resins

These products exhibit various effects in antistatic agents, plasticizers and releasing agents when they are blended with synthetic resins.

The degree of these effects depends on the type and the amount of resin used. Therefore, depending on the resin, the kind of NEWPOL products, their optimal additive amount and other conditions should be tested beforehand.

Important: Before handling these products, refer to the Safety Data Sheet for recommended protective equipment, and detailed precautionary and hazards information.

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