

CARBOWAX™ Polyethylene Glycols

Innovation, performance, flexibility and
quality from the global leader in PEGs



DOW®



CARBOWAX™ PEGs and MPEGs

Improving formulations and processes for more than 80 years

Polyethylene Glycols (PEGs) and Methoxypolyethylene Glycols (MPEGs) are among the most versatile chemical ingredients available to formulators and manufacturers. Since 1940, CARBOWAX™ brand PEGs and MPEGs have set industry standards for innovation, performance, formulation flexibility and quality. Formulators in a wide range of industries value the contributions CARBOWAX™ PEGs and MPEGs make to their products, including enhanced solvency, lubricity, hygroscopicity, and other important functional properties. Manufacturing chemists choose CARBOWAX™ PEGs and MPEGs to improve production processes, in applications including mold and mandrel releases, lubricants, anti-static agents and other processing aids. CARBOWAX™ PEGs can also be used as chemical intermediates, resulting in products for foam control, thickeners, and resins.

Innovation

Dow is a reliable source of innovative solutions. Whether those innovations come in the form of new products, increased processing efficiency, support for quality requirements, or tailored supply chain solutions, you can look to Dow for the science, technology and knowhow to help support your innovations.

Performance

The performance of CARBOWAX™ PEGs and MPEGs has been proven over decades of use in a variety of industries. It starts with the physical properties and primary hydroxyl functionality of PEGs and MPEGs, which make them valuable formulating ingredients or intermediates. CARBOWAX™ PEGs and MPEGs offer attractive solubility properties, are hygroscopic, enable viscosity profile design, and can undergo reactions typical of alcohols.

Flexibility

CARBOWAX™ PEGs and MPEGs may be a suitable product for your application. CARBOWAX™ PEGs and MPEGs are available in a wide range of viscosities and melting points for wide formulating flexibility. By choosing a suitable product grade, or blending products, you can achieve the desired balance of water solubility, hygroscopicity, vapor pressure, melting or freezing range, and viscosity. Flexibility is further enhanced by multiple product forms including liquid, powder, granular and flake materials.

Quality

Whether you are concerned about consistent performance or managing quality across your supply chain, the CARBOWAX™ PEGs and MPEGs team supports you with an exceptional commitment to quality. We were the first U.S. producer of PEGs and MPEGs with manufacturing facilities registered to the ISO 9002 quality standard. That heritage continues as we maintain our current registration to ISO 9001 (certificate available upon request) and our total commitment to providing quality products, quality service and quality support.

Global supply capabilities

As the world's largest supplier of PEG and MPEG products, Dow operates manufacturing facilities in several locations. Our ability to meet various PEG and MPEG requirements globally is supported by Dow inventory management solutions and our network of strategically located terminal facilities that help enable delivery by marine, rail, and truck transportation. We offer Product Stewardship assistance for proper handling of CARBOWAX™ PEG and MPEG products throughout the supply chain.



CARBOWAX™ PEGs and MPEGs

Chemistry and product line

CARBOWAX™ PEGs and MPEGs are a family of water soluble linear polymers formed by the addition reaction of ethylene oxide to an ethylene glycol equivalent. The general formula for polyethylene glycol is: $H-(OCH_2CH_2)_n-OH$ and for methoxypolyethylene glycol: $CH_3-(OCH_2CH_2)_n-OH$ where “n” is the average number of repeating oxyethylene groups.

CARBOWAX™ PEGs and MPEGs are available in a wide range of viscosities and melting points to offer flexibility to help optimize formulations. Depending on molecular weight,

CARBOWAX™ products are available in liquid, molten, solid, granular, flake and powder forms.

CARBOWAX™ Polyethylene Glycols are available in average molecular weights ranging from 200 to 8000. CARBOWAX™ Methoxypolyethylene Glycols are available in average molecular weights ranging from 350 to 750. CARBOWAX™ PEG 540 Blend, a mixture of PEG 300 and PEG 1450, completes the family of CARBOWAX™ products.

Typical physical properties of CARBOWAX™ PEGs and MPEGs*

Product	Range of average molecular weight	Range of average hydroxyl number, Mg KOH/g	Liquid density, g/cc			Melt or freezing range, °C	Solubility in water at 20°C, % by wt	Viscosity at 100°C, (210°F), cSt
			20°C	60°C	80°C			
CARBOWAX™ PEGs								
200	190 to 210	535 to 590	1.1238	1.0921	1.0763	(d)	Complete	4.3
300	285 to 315	340 to 394	1.1249	1.0927	1.0766	-15 to -8	Complete	5.8
400	380 to 420	264 to 300	1.1255	1.0931	1.0769	4 to 8	Complete	7.3
540 Blend (a)	—	—	(e)	1.0930	1.0765	38 to 41	73	15.1
600	570 to 630	178 to 197	1.1258	1.0931	1.0767	15 to 25	Complete	10.8
1000	950 to 1050	107 to 118	(e)	1.0927	1.0765	35 to 40	80	17.2
1450	1305 to 1595	70 to 86	(e)	1.0919	1.0761	42 to 46	72	26.5
1450 aqueous	1305 to 1595	70 to 86	(e)	1.0919	1.0761	42 to 46	72	26.5
3350	3015 to 3685	30 to 38	(e)	1.0926	1.0769	53 to 57	67	90.8
4000	3600 to 4400	25 to 32	(e)	1.0926	1.0769	53 to 59	66	140.4
4000 aqueous	3600 to 4400	25 to 32	(e)	1.0926	1.0769	53 to 59	66	140.4
4600	4140 to 5060	22 to 27	(e)	1.0926	1.0764	54 to 60	65	183.9
8000	7000 to 9000	12 to 16	(e)	1.0852 (b)	1.0689 (c)	55 to 62	63	821.7
CARBOWAX™ MPEGs								
350	335 to 365	154 to 167	1.0894	1.0547	1.0373	-5 to 10	Complete	3.9
550	525 to 575	97 to 107	1.1039	1.0690	1.0515	15 to 25	Complete	6.5
750	715 to 785	71 to 78	(e)	1.0761	1.0595	27 to 32	Complete	10.3v

* Typical properties, not to be construed as specifications.

FOOTNOTES:

- (a) A 41/59 wt % mixture of PEG 300 and PEG 1450
- (b) At 70°C
- (c) At 90°C
- (d) Sets to glass below -65°C
- (e) Solid at specified temperature
- (f) 50% aqueous solution

- (g) At 40°C
- (h) Negative indicates heat evolved
- (i) Cosmetic, Toiletry and Fragrance Association
- (j) International Nomenclature Cosmetic Ingredient
- (k) Proposed CTFA/INCI Name

Average number of repeating oxyethylene units	Surface tension at 25°C, mN/m	Heat of fusion, cal/g	Heat of combustion (h) at 25°C, Btu/lb (J/g)	CTFA (i)/INCI (j) nomenclature	Supplied form	Appearance at 27°C
4.1	44.5	(d)	-10,510 (-26,753)	PEG-4	Liquid	Clear, Viscous liquid
6.4	44	37	-10,840 (-25,196)	PEG-6		
8.7	44.5	36	-11,010 (-25,591)	PEG-8		
(a)	(e)	37	-11,070 (-25,730)	PEG-6 (and) PEG-32	Fused Solid	Soft, opaque white solid
13.2	44.5	35	-11,100 (-25,800)	PEG-12	Liquid	Clear, viscous liquid
22.3	(e)	38	-11,240 (-26,125)	PEG-20	Fused Solid	Soft, opaque white solid
32.5	(e)	37	-11,300 (-26,265)	PEG-32	Flake	
32.5	(e)	37	-11,300 (-26,265)	PEG-32	Liquid in bulk	
75.7	(e)	39	-11,380 (-26,451)	PEG-75	Granular, Powder	Hard, opaque white solid
90.5	(e)	45	-11,390 (-26,474)	PEG-90 (k)		
90.5	(e)	45	-11,390 (-26,474)	PEG-90 (k)	Liquid in bulk	
104.1	(e)	45	-11,390 (-26,474)	PEG-100	Granular	Hard, opaque white solid
181.4	51.3 (f)	41	-11,410 (-26,521)	PEG-180	Granular, Powder	
7.2	40.5	26	-11,340 (-26,358)	PEG-6 Methyl Ether	Liquid	Clear, viscous liquid
11.8	40.7 (g)	30	-11,400	Methoxy PEG-10		
16.3	40.7 (g)	34	-11,350 (-26,381)	Methoxy PEG-16	Fused Solid	Soft, opaque white solid



A world of applications

The physical properties and the primary hydroxyl functionality of CARBOWAX™ PEGs and MPEGs can make them highly versatile formulating ingredients and intermediates and have resulted in their widespread commercial use. Following are just a few of the potential uses for CARBOWAX™ products. We invite you to consult with our team to explore a solution to your product or process requirements.



End use guide for CARBOWAX™ PEGs and MPEGs

Typical industrial application	Key properties							Formulation uses and contributions	Recommended products
	Water solubility	Viscosity	Freeze/Melt range	Solvency	Lubricity	Hygroscopicity	Chemical structure		
Adhesives		x	x				x	Used as plasticizers to increase lubricity and add humectancy to maintain wet tack strength.	CARBOWAX™ PEG 200, 300, 400, 600
Agriculture	x			x		x		Water solubility and solvency properties make PEGs excellent vehicles for organically-derived insecticides, hormones, and herbicides. EPA approved for use as inert ingredients in pesticides.	CARBOWAX™ PEG 200, 300, 3350, 4000, 8000
Antistatic agent						x		Reduces static by absorbing water.	CARBOWAX™ PEG 200, 300, 400, 600
Ceramics	x	x		x	x		x	Function as plasticizers, binders, carriers, and lubricants. Smooth, clean burnout during firing.	Binder: CARBOWAX™ PEG 3350, 4000, 8000 Lubricant: CARBOWAX™ PEG 200, 300, 400, 600
Chemical intermediate	x			x			x	Primary hydroxyl functionality allows reactions typical of alcohols, such as conversion of functional alcohol group to esters, ethers, amines and acetals.	CARBOWAX™ PEG 200, 300, 400, 600, 1000, 1450, 3350, 4000, 4600, 8000
Dye carrier		x		x				Carrier and dispersant for dye particles.	CARBOWAX™ PEG 200, 300, 400, 600
Humectant						x		Attracts and retains moisture from atmosphere. Suitable for inks and adhesives. Replaces other hygroscopic materials such as glycerin and propylene glycol	CARBOWAX™ PEG 200, 300, 400, 600
Inks		x		x	x	x		Act as humectants, solvents, lubricants, and dye carriers. Provide controlled hygroscopicity for ink setting.	CARBOWAX™ PEG 200, 300, 400, 600
Lubricants	x	x			x			Natural lubricity, low volatility, and water solubility. Nonstaining to metal parts, textiles and clothing; are easily cleaned and are noncorrosive to rubber and plastic materials.	CARBOWAX™ PEG 200, 300, 400, 600, 1000, 1450, 3350

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	Water solubility	Viscosity	Freeze/Melt range	Solvency	Lubricity	Hygroscopicity	Chemical structure		
Metalworking		x			x			Used as lubricants for stamping and rolling, fluids for cutting and grinding, and as components of buffing and polishing compounds.	CARBOWAX™ PEG 400, 600
Mandrel releases	x	x			x			Used as a lubricant. Non staining to metal parts. Easily cleaned.	CARBOWAX™ PEG 3350, 4000, 4600, 8000
Mining	x						x	Drilling fluid intermediate and ingredient.	CARBOWAX™ PEG 3350, 4000, 4600, 8000
Mold release agent	x	x			x			Provides lubrication that is easy to rinse away with water; low ash resulting in no residue.	CARBOWAX™ PEG 200, 300, 400, 600
Paints and coatings					x		x	Used as intermediates in resin synthesis to enhance water dispersibility. Also used as modifiers and binders in latex paints and shellacs.	CARBOWAX™ PEG 200, 300, 1450, 3350, 4000
Paper and paper products				x	x			Adds softening, flexibility, and slip characteristics. Adds effective lubricity to coatings. PEGs also serve as color stabilizers, plasticizers, anti-stick agents, and dimensional stabilizers.	CARBOWAX™ PEG 200, 300, 400, 600
Plasticizer							x	Improves the fluidity of materials; non corrosive.	CARBOWAX™ PEG 200, 300, 400, 600, 1000
Powder metallurgy		x	x		x			PEGs are used as binders in metal powder systems.	CARBOWAX™ PEG 8000
Rubber and elastomers	x				x			Used as mold release agents and lubricants for fabricating natural and synthetic rubbers. Water solubility allows easy application and removal. Dispersant for compounding.	CARBOWAX™ PEG 300, 400, 1450, 3350, 4000, 8000
Textiles	x				x	x		Serve as lubricants, softeners, antistatic agents, and conditioning agents. PEG esters are used as processing and finishing aids and as easily removable sizes.	Softener – CARBOWAX™ PEG 540 Blend, 3350 Polyester Intermediate – CARBOWAX™ PEG 400, 600
Soaps and detergents	x		x		x			Water soluble, and provides good solvent properties for other formulation components; also provides excellent control of texture, viscosity and degree of formulation hygroscopicity.	CARBOWAX™ PEG 300, 400, 600, 1000, 1450, 3350, 4000, 8000
Toilet bowl cleaners	x			x				Provides viscosity and solvency for other formulation ingredients.	CARBOWAX™ PEG 8000
Wood treatment	x					x	x	Prevents shrinkage, drying, and cracking; helps maintain wood softness. Allows kiln drying at higher temperatures, and provides long-term dimensional stabilization.	CARBOWAX™ PEG 200, 300, 400, 3350, 4000





Product stewardship

Dow has a fundamental concern for all who make, distribute and use its products, and for the environment in which we live. This concern is the basis of our product stewardship philosophy by which we assess the health and environmental information on our products and take appropriate steps to protect employee and public health and our environment. Our product stewardship program rests in each and every individual involved with Dow products – from the initial concept and research to manufacture, use, sale and disposal of each product.

Customer notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to help ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel will assist customers in dealing with environmental and product safety considerations. Dow product literature, including Safety Data Sheets, should be consulted prior to use of Dow products.

Learn more

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About Dow

The Dow Chemical Company (Dow) combines science and technology knowledge to develop premier materials science solutions that are essential to human progress. Dow has one of the strongest and broadest toolkits in the industry, with robust technology, asset integration, scale and competitive capabilities that enable it to address complex global issues. Dow's market-driven, industry-leading portfolio of advanced materials, industrial intermediates, and plastics businesses deliver a broad range of differentiated technology-based products and solutions for customers in high-growth markets such as packaging, infrastructure, and consumer care. More information can be found at www.dow.com.

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