Eastman solvents—technical tip

Eastman EB solvent

Regulatory overview

Prior to the EPA's listing of EGBE (ethylene glycol butyl ether) as a HAP (Hazardous Air Pollutant) in 1990, Eastman EB solvent was a standard component in many formulations. The solvent provides formulators with better coupling efficiency than many alternatives. Used in a wide variety of applications, Eastman EB solvent is particularly popular in cleaning applications as well as architectural, OEM, wood, and can coatings markets.

On November 29, 2004, the Environmental Protection Agency (EPA) removed ethylene glycol butyl ether (EGBE) from the Clean Air Act (CAA) list of hazardous air pollutants (HAPs). Upon delisting, EGBE was no longer subject to Maximum Achievable Control Technology (MACT) and other specific requirements found in the CAA.

Introduction

Eastman EB (ethylene glycol monobutyl ether) is a good solvent for alkyd, phenolic, maleic, epoxy, and nitrocellulose resins. It is an excellent retarder solvent for lacquers, improving gloss, flow-out, and antiblushing properties. Taking advantage of its high flash point, complete water solubility, slow evaporation rate, low surface tension, and high coupling efficiency, formulators often use Eastman EB in amine-solubilized, water-dilutable coatings. In waterborne latex emulsions, Eastman EB often improves film integrity by enhancing polymer coalescence. EB solvent is an important component in many household and industrial cleaners, enhancing soil penetration and cleaning ability. Eastman EB is also used as a coupling solvent in nail and hair care products. The INCI (International Nomenclature of Cosmetic Ingredients) name for Eastman EB solvent is butoxyethanol.

Table 1 **Physical properties**

	Eastman EB solvent	Dowanol™ PnB
Evaporation rate (*n*-butyl acetate = 1)	0.09	0.09
Weight/volume, lb/gal[a]	7.51	7.37
Surface tension, dynes/cm @ 20°C	26.6	27.4
Water solubility, wt% @ 20°C		
In water	Complete	6.4
Water in	Complete	15.5
Electrical resistance, megohms	<0.2	0.4
Hansen solubility parameters[b]		
Nonpolar	7.8	7.5
Polar	2.5	2.2
Hydrogen bonding	6.0	4.5
Total	10.2	9.0
Dilution ratio[c]		
Toluene	3.4	1.9
VM & P naphtha	2.1	0.9

[a] *@ 20°C*

[b] *Shown as $[cal/cm^3]^{½}$*

[c] *Dilution ratios determined with nitrocellulose*

Features

- Superior coupling ability
- Lower surface tension for improved wetting of substrate
- Higher dilution ratio versus P-series glycol ethers
- Active solvent for a wide range of resins
- Compatible with water and many organic chemicals, ranging from alcohols and esters to naphthas and aromatics

Solvent activity is very important among solvent property requirements. The more active the solvent, the less is required to reach the desired coating application viscosity. This is extremely important today since VOC regulations usually specify the solvent content of a coating in g/L or lb/gal. Solvent activity of Eastman EB Solvent versus Dowanol™ PnB from The Dow Chemical Company is shown in Table 2.

Conclusion

The versatility of Eastman EB solvent has led to its being a key ingredient in hundreds of products ranging from industrial and consumer cleaning solutions to water-and solvent-based coatings. Eastman EB is used in many other applications such as textile dyeing and printing inks, leather treatment, production of plasticizers; stabilizer in metal and household cleaners, insecticides, herbicides, and rust removers. Although alternatives to Eastman EB solvent have been suggested, its superior performance and economical cost have made it the preferred formulating choice.

Table 2 **Resin solubility**[a]

Component	Weight % N.V.	Eastman EB solvent	Dowanol™ PnB
Acrylamac™ HS 232-2980 acrylic resin[b]	70	665	748
Duramac™ HS 57-5720 alkyd resin[c]	65	788	910
Bakelite™ CK 2400 phenolic resin[d]	40	240	400
Butvar™ B-76 polyvinyl butyral[e]	10	750	1150
Epon™ 1007F epoxy resin[f]	50	1600	2000
Polymac™ HS 57-5776 polyester resin[g]	65	311	394
RS ½-sec nitrocellulose[h]	8	100	110

[a] *Brookfield viscosity @ 25°C, cP—ASTM D2196*

[b] *PCCR USA, Inc.—The acrylic resin is supplied at 80 wt% solids in MAK, then diluted to 70 wt% solids with solvent shown.*

[c] *PCCR USA, Inc—The alkyd resin is supplied at 75 wt% solids in a 90/10 wt% MPK/n-butyl acetate blend, then reduced to 65 wt% solids with solvent shown.*

[d] *Momentive Speciality Chemicals Investments Inc.*

[e] *Solutia Inc.*

[f] *Momentive Specialty Chemicals Inc.*

[g] *PPCR USA, Inc.—The polyester resin is supplied at 85 wt% solids in PM acetate, then reduced to 65 wt% solids with solvent shown.*

[h] *Green Tree Chemical Technologies, Inc.*

EASTMAN

Eastman Chemical Company
Corporate Headquarters
P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

Telephone:
U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, (1) 423-229-2000
Fax: (1) 423-229-1193

Eastman Chemical Latin America
9155 South Dadeland Blvd.
Suite 1116
Miami, FL 33156 U.S.A.

Telephone: (1) 305-671-2800
Fax: (1) 305-671-2805

Eastman Chemical B.V.
Fascinatio Boulevard 602-614
2909 VA Capelle aan den IJssel
The Netherlands

Telephone: (31) 10 2402 111
Fax: (31) 10 2402 100

Eastman (Shanghai) Chemical Commercial Company, Ltd. Jingan Branch
1206, CITIC Square
No. 1168 Nanjing Road (W)
Shanghai 200041, P.R. China

Telephone: (86) 21 6120-8700
Fax: (86) 21 5213-5255

Eastman Chemical Japan Ltd.
MetLife Aoyama Building 5F
2-11-16 Minami Aoyama
Minato-ku, Tokyo 107-0062 Japan

Telephone: (81) 3-3475-9510
Fax: (81) 3-3475-9515

Eastman Chemical Asia Pacific Pte. Ltd.
#05-04 Winsland House
3 Killiney Road
Singapore 239519

Telephone: (65) 6831-3100
Fax: (65) 6732-4930

www.eastman.com

TT-17B 6/13