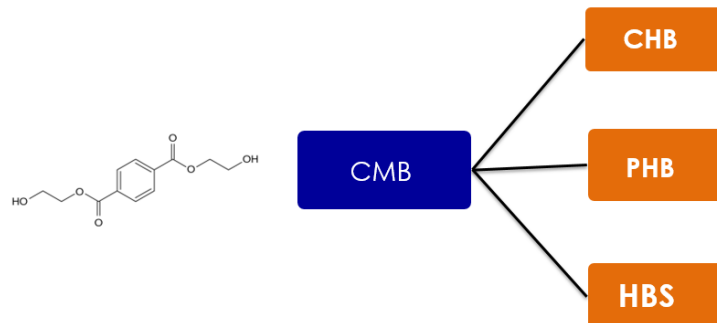


# Our innovation in BHET Polyol series



FENC cooperate with OUCC aim to developing a series of benzoic acid-based aromatic polyols. Such products with benzene ring and ester-based structure may enhance the material with heat resistance, abrasion resistance, hardness, adhesion and flame retardance properties, and can be applied in PU foam & flooring, coating resin, polyester, carbon dispersion, elastomer and other applications.

Today Terephthalic acid (PTA) or Dimethyl terephthalate (DMT) is used as starting material to produce aromatic polyols. From the former (PTA), engineer will encounter lower reactivity, higher reaction temperature, more oligopolymer, resulting in the final product with melting point rise and solubility decline. From the latter (DMT), reaction can be carried out under milder conditions, but the process will be huge by-product methanol. This waste is heavy burden to plant in safety & environment management and regulatory compliance. Now we develop a novel green process, can completely overcome the above-mentioned production shortcomings, but also improve the purity and nature of the aromatic polyols.

**CMB product:** it contains high BHET or “Bis(2-Hydroxyethyl) terephthalate” ingredient, which is the basic monomer. With diol reaction groups, you can exchange with other desired polyols under milder conditions of transesterification, to improve the mechanical strength and flame retardance properties of end product, to have higher productivity and lower solvent waste.

**CHB series product:** It is designed for PUR & PIR foam application. Such product is easy operation with lower viscosity and higher fluidity. Its high benzene ring content can bring excellent flame retardance and reduce the flame retardant from external addition.

**PHB series products:** It could be a tailor made on client’s requirements to end product characteristics, by adjusting the hydrophobic/hydrophilic chain segment, benzene ring content, make the product with better size stability, thermal stability, mechanical strength, flame retardance and other characteristics. The sp<sup>2</sup> domain in benzene ring structure will be help in the dispersion, emulsification, Demulsification, thickening for graphene, nano-carbon tubes and other carbon materials.

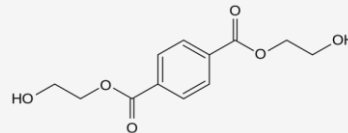
**HBS series products:** With the introduction of hydrophobic material in BHET, our HBS has better hydrophobic and hydrolysis resistance than CHB and PHB series. It is suitable for use in indoor or outdoor building or floor coatings.

# BHET monomer

## CMB

Chemical : Bis(2-Hydroxyethyl) terephthalate

CAS : 959-26-2



Description :

- FENC is the first to supply commercial BHET monomer (the newly flake grade called CMB08) with proprietary technology. This product has many excellent characteristics, including benzene ring structure enhance the material with thermal stability, mechanical strength and flame retardance, ester-based structure brings adhesion with polyester, diol structure can be esterified, trans-esterified and reacted with isocyanate and other reactions. In addition, the BHET structure plays an effective dispersant to graphene, nano-carbon tubes, carbon black, pigments.
- There is no organic solvents and toxic substances in our BHET production process. It's advanced technology and product compared with other raw polyester materials (e.g., polymer & oligomer from recycled PET or DMT monomer). Our CMB has lower melting point and can be carried out in lower temperature, which reduces side reactions and power consumption in the esterification process, providing the advantages of easy operation and environmental protection. There is common sublimation and the generation of waste methanol in DMT process, which bring more cost and headache to engineers.

CMB10 Sales Specification:

Property	Unit	Data	Method*
Appearance	--	Pale solid	@25°C
Active BHET	Area %	≥90	LC-UV
OH Value	mg KOH/g	470~530	Titration
Moisture	wt%	≤20	Karl Fischer
Acid Value	mg KOH/g	≤30	Titration

Typical properties :

Property	Unit	Data	Method*
Specific Gravity	g/cm <sup>3</sup>	1.20 – 1.40	@30°C

\*Please contact our sales window for more information

Main Application :

- Raw materials for dyeing and finishing agent, synthetic resin, Paint, Coating, Adhesive, Sealant and elastomer.
- Monomer or materials for synthesis of polyester and related products, or other resins.

Standard Packing :

200kg per 53 gallons drum

Shelf Life :

OUCC will endorse the results on the certificate of analysis (COA) for a period of up 1 year from the date of manufacture for material in original, unopened, properly stored containers. Beyond one year from this COA issuing date, we recommend the material should be reexamined to ensure that it is still suitable for use.

Handling and Storage :

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Avoid direct exposure to sunlight.

Regulatory data :

- All components of this product are included in the Taiwan Chemical Substance Inventory (TSCI; Registration no. EPEP4A00008008)

# BHET derivatives

## 1. CHB series

Chemical : Terephthalic acid, polyethoxylated

Description :

Compared with the traditional polyether polyol (eg. PPG), CHB product has lower viscosity easy to handle, high benzene ring content, good smoke suppression, can greatly improve flame retardance of PU foam, reduce external additive of flame retardant. Based on our study, no melt droplets can be observed in specific PUR and PIR foaming without external flame retardants.

## 2. PHB series

Chemical : Terephthalic acid, polyethoxylated

Description :

PHB is refined polyester polyol compared with the CHB product. This product has many excellent characteristics, including benzene ring structure enhance the material with thermal stability, mechanical strength and flame retardance, ester-based structure brings adhesion with polyester, diol structure can be esterified, trans-esterified and reacted with isocyanate and other reactions. In addition, the benzene ring structure plays an effective dispersant to graphene, nano-carbon tubes, carbon black, pigments.

## 3. HBS series

Chemical : Aromatic polyester polyol

Description :



R&D CENTER

HBS is hydrophobic aromatic polyester polyols compared with CHB and PHB. It contains more than 30% bio content contributes excellent properties in hydrophobic and hydrolysis resistance. It can be applied in 2K PU coating system of flooring material, express better chemical and weather resistance than conventional Epoxy flooring.

### **Standard Packing :**

200kg per 53 gallons drum

### **Shelf Life :**

OUCC will endorse the results on the certificate of analysis (COA) for a period of up 1 year from the date of manufacture for material in original, unopened, properly stored containers. Beyond one year from this COA issuing date, we recommend the material should be reexamined to ensure that it is still suitable for use.

### **Handling and Storage :**

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Avoid direct exposure to sunlight.

### **Regulatory data :**

- All components of CHB, PHB, HBS products are included in the Taiwan Chemical Substance Inventory (TSCI; Registration no. EPEP4A00008008)

## Physical-Chemical Properties of BHET Polyol

Property	Appearance	OH Value (mgKOH/g)	Benzene ring (%)	Functionality	Viscosity (cps, 30°C)	Application
CHB02	Yellow liquid	400~450	22~25	2	200~500	PU rigid foam
CHB05	Yellow liquid	300~350	17~20	2	150~450	PU rigid foam
CHB06	Yellow liquid	320~380	30~35	2~2.5	200~500	PU rigid foam
PHB01	Yellow liquid	155~175	20~25	2	400~1000	Polyol for PU, Dispersant
PHB02	Yellow liquid	95~110	12~16	2	500~1500	Polyol for PU, Dispersant
PHB03	Yellow liquid	205~230	30~35	2	500~1500	Polyol for PU, Dispersant
PHB04	Yellow liquid	155~175	20~25	2	400~1000	Polyol for PU, Dispersant
PHB05	Yellow liquid	280~320	30~35	2	500~1500	Polyol for PU, Dispersant
HBS1230	Yellow liquid	200~250	10~15	3.5~4.0	1000~3000	PU coating, adhesive
HBS1300	Yellow liquid	280~330	15~20	3.0~3.5	500~1500	PU coating, adhesive
HBS2220	Yellow liquid	200~250	10~15	3.5~4.0	3000~5000	PU coating, adhesive
HBS180	Yellow liquid	160~200	--	2.6~2.8	200~400	PU coating, adhesive
HBS200	Yellow liquid	180~220	5~10	3.1~3.5	600~1200	PU coating, adhesive
HBS300	Yellow liquid	280~320	--	2.8~3	200~700	PU coating, adhesive

## 2 pack PU coating application of HBS series

	OH Value (mgKOH/g)	Mixing formulation g / 100 g pMDI *	Shore D ( After 1 day)	Shore D ( After 7 day)	Tack free time(mins)
HBS1230	200~250	175	56	62	55
HBS1300	280~330	135	63	69	60
HBS2220	200~250	180	62	68	70
HBS180	160~200	230	10	15	120
HBS200	180~220	200	32	45	90
HBS300	280~320	130	35	48	100

\* eg. Millionate MR-200 , NIHON UNIPOLYMER CO.

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Oriental Union Chemical Corporation / Specialty Chemical Business Unit / Surfactant & Performance Chemicals department (SPC dept.)

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