Specialty Chemicals

Functional Monomers

Additional effects and optimized performance in processing and use

Special molecules known as functional monomers provide a polymer with additional, enhanced performance effects and/or significantly improve processing performance when incorporated in the polymerization process.

SONGWON develops, manufactures and supplies different functional monomers based on three backbone chemistries: dicyclopentadiene (DCPD) phenol, bisphenol, and diacid anhydrates and diamines for high performance resins.

Our functional monomers are used as hardeners in epoxy and phenolic resins as well as in certain polymers, for example polycarbonate, polyester, polyimide and polybenzoxazine. These are suitable for a wide range of industries, end products ranging from tiny electronic components such as integrated circuit chips to large scale composites, for instance wind turbine rotor blades.

SONGWON offers a broad range of functional monomers

DCPD (dicyclopentadiene) type

These are mainly used as an epoxy resin modifier (ERM) in epoxy chain-extending reactions, primarily for the manufacture of epoxy resins and composites.

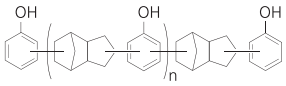
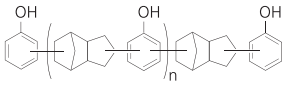
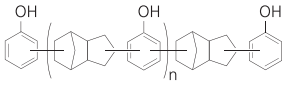
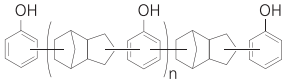
Bisphenol type

These are used in the manufacture of numerous plastics and epoxy resins. End uses for bisphenol-based plastic, which is clear and tough, include a variety of common consumer goods, such as water bottles, sports equipment, CDs and DVDs. Epoxy resins containing bisphenols are used to line water pipes and coatings, and in the manufacture of thermal paper.

Monomers for high performance polymers

SONGWON's ongoing expansion of its product offering includes the development, upscaling and commercial sales of a variety of special monomers used in the manufacture of high performance polymers and resins. These are designed for markets focusing on clear resins with low thermal expansion coefficients (CTEs) and high thermal stability. A further key driver of product development is the growing demand for polybenzoxazine (PBO) and polyhydroxystyrene (PHS) resins.

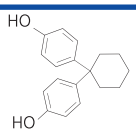
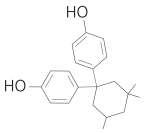
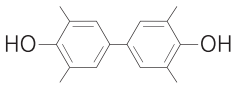
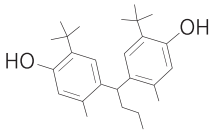
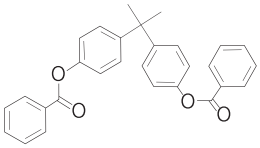
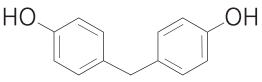
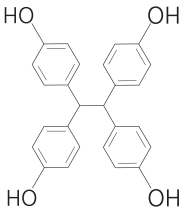
Functional Monomers Overview

			OH equivalent (g/eq)	Softening point (°C)
DCPD Type	**ERM-6095** Dicyclopentadiene phenol CAS NO. 30420-31-6		168 ~ 174	84 ~ 95
	ERM-6105 Dicyclopentadiene phenol CAS NO. 30420-31-6		175 ~ 184	102 ~ 112
	ERM-6115 Dicyclopentadiene phenol CAS NO. 30420-31-6		185 ~ 195	114 ~ 120
	ERM-6140 Dicyclopentadiene phenol CAS NO. 30420-31-6		195 ~ 201	125 ~ 128

SONGWON's DCPD phenol adducts are distinguished by their high purity and excellent consistency. If they are to be used as hardeners, we can help customers meet still tighter specifications, depending on their requirements.

In addition to these four standard products, we are also able to provide customer specific monomers with tailor-made softening points (including below 80°C), solution viscosity and oligomer content.

Bisphenol Type

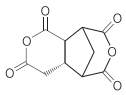
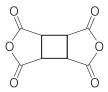
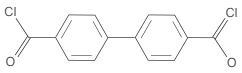
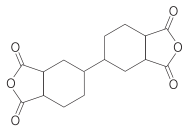
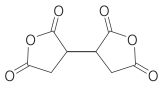
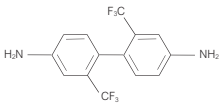
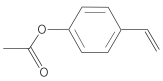
		Comment	Melting Range (°C)
BP-Z 4,4'-cyclohexylidene bisphenol CAS NO. 843-55-0 White PW		Bisphenol Z, purity >99%	190.0
BP-TMC 1,1'-bis(4-hydroxyphenyl)-3,3,5-trimethylcyclohexane CAS NO. 129188-99-4 White PW		High purity grade and epoxy grade	208.0
TMBP 2,2',6,6'-tetramethyl-4,4'-biphenol CAS NO. 2417-04-01 Yellowish PW		Highest purity	223.0 ~ 225.0
BBM 4,4'-butylidenbis(6-tert-butyl-3-methylphenol) CAS NO. 85-60-9 White PW		Scale up status	208.0 ~ 214.0
BP-Benzoate Propane-2 2-diyl di-p-phenylene dibenzoate CAS NO. 2297-14-5 White PW		Bisphenol A dibenzoate, high purity	164.0
4,4'-Bisphenol F(H) Bis(4-hydroxyphenyl) methane CAS NO. 620-92-8 White PW		Single isomer Bisphenol F	160.0
TPE 1,1,2,2-Tetrakis (4-hydroxyphenyl) ethane CAS NO. 7727-33-5 White PW		high purity and general grade available	> 310

Our bisphenol product range is characterized by high chemical purity and low free phenol content. Since the products are manufactured on multifunctional production lines, we are able to offer high volumes at reasonable cost.

Some products are also available as general grade raw materials for epoxidation or phenolic resins.

SONGWON's high performance monomers fulfill the most stringent chemical purity demands, including in optically clear applications such as displays and optical film. In addition, metal content can if required be minimized using proprietary SONGWON technology.

High performance monomers

		Application	Comment
TCAA 3-(Carboxymethyl)-1,2,4-cyclopentanetricarboxylic acid 1,4:2,3dianhydride CAS NO. 6053-46-9		Clear PI varnish and film, alignment layer	Commercial, available
CBDA Cyclobutane 1,2,3,4, tetra-carboxylic acid dianhydride CAS NO. 4415-87-6		Clear PI varnish and film, alignment layer, PSPI	Commercial, available
BPDC Biphenyl 4,4' dicarboxyl-chloride CAS NO. 7158-32-9		Clear PI varnish and film, PBO, PA, coplymers	Commercial, available
HBPDA Dicyclohexyl-3,4,3',4'-tetra-carboxylic dianhydride CAS NO. 122640-83-9		Clear PI varnish and film, coplymers	Under scale-up
BTDA 1,2,3,4-Butanetetracarboxyl-ic 1,2:3,4-dianhydride CAS NO. 4534-73-0		Clear PI varnish and film, copolymers, alignment	Under scale-up
TFMB 2,2'-Bis(trifluoromethyl)-[1,1'-biphenyl]-4,4'-diamine CAS NO. 341-58-2		Mostly used diamine for clear PI film, varnish, alignment layer	Pilot production
ASM Acetoxystyrene CAS NO. 2628-16-2		High purity PHS and PHS copolymers for semicon and display	Pilot production

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Standard Packaging

- **DCDP type:** 20 kg PE bag, 500 kg bigbag
- **Bisphenol type:** 20 kg PE bag, 500 kg bigbag
- **High performance monomers:** custom package available, 1kg, 2.5 kg, 5 kg sealed aluminium bag in 20 kg carton box

Key to Abbreviations of Physical Forms

- **PW:** Powder
- **SB:** Semi Bead
- **SL:** Solid
- **FF:** Free Flow
- **DW:** Dispersion
- **MB:** Micro Beads
- **FC:** Fusion Crystal
- **LQ:** Liquid or Molten
- **BD:** Beads
- **DF:** Dust Free Flow
- **CP:** Crystalline Powder
- **PS:** Pastilles
- **GR:** Granule
- **FG:** Fine Grind
- **VL:** Viscous Liquid

Transport and Storage

As a general guideline, we recommend storing the products mentioned in this brochure in their original sealed containers in a cold and dry place. For more detailed information on a specific product, please refer to the corresponding **Technical Data Sheet.**

By law, a number of chemical products must be labeled in respect of transport, storage and handling. Thus corresponding care is a prerequisite for their appropriate handling. Furthermore, local legal regulations may apply.

Detailed information is given in the respective **Safety Data Sheets.**

About SONGWON Industrial Group

SONGWON, which was founded in 1965 and is headquartered in Ulsan, South Korea, is a leader in the development, production and supply of specialty chemicals.

The second largest manufacturer of polymer stabilizers worldwide, SONGWON operates group companies all over the world, offering the combined benefits of a global framework and readily accessible local organizations.

Dedicated experts work closely together with customers to develop tailor-made solutions that meet individual requirements.

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