D.E.H.™ 24 Epoxy Curing Agent

Description

D.E.H. 24 Epoxy Curing Agent is a liquid aliphatic polyamine curing agent.

Introduction

D.E.H. 24 Epoxy Curing Agent is an economical aliphatic polyamine hardener, triethylenetetraamine (TETA), that offers a short pot-life and cures in minutes with standard unmodified liquid epoxy resins. Similar to D.E.H. 20 Epoxy Curing Agent, it provides lower vapor hazard to workers due to its higher boiling point.

D.E.H. 24 Epoxy Curing Agent is used for maintenance paints, the manufacture of epoxyamine adducts, in adhesives, and civil engineering applications. It is also used as an accelerator for polyamide curing agents. In electrical applications, D.E.H. 24 Epoxy Curing Agent is used for casting, potting and encapsulation.

NOTE: This amine curing agent is hygroscopic and may pick up moisture and carbon dioxide from the atmosphere. See the Safety and Handling section on page 2.

Typical Applications

This product is suitable for use in applications such as:

- Adhesives
- Casting and Tooling
- Civil Engineering
- Composites
- Marine and Protective Coatings
- Potting and Encapsulation

Typical Properties

These properties are typical but do not constitute specifications.

Property	Value
Amine Hydrogen Equivalent Weight (g/eq)	≈ 24
Diethylenetriamine = TETA (wt%)	96 Min.
Amines, Molecular Weight (DETA)	3 Max.
Color (Platinum Cobalt)	50 Max.
Viscosity @ 25°C (mPa•s)	19.5 – 22.5
Density @ 25°C (g/ml)	0.981
Flash Point (°C)	118
Water Content (wt%)	0.5 Max.
Boiling Point @ 760 mm Hg (°C)	277
Freezing Point (°C)	-35
Vapor Pressure @ 20°C (mm Hg)	<0.01
Specific Heat @ 20°C (cal/g °C)	0.63
Surface Tension @ 20°C (dynes/cm)	22.2
Coefficient of Expansion @ 20°C (1/°C)	0.0075
Refractive Index @ 20°C	1.499
Nitrogen Content (wt%)	37.0
Amine Value (mg KOH/g)	1443
Shelf Life (Months)	24

Ethylene Amines

Aliphatic polyamines are low viscosity, economical, fast reacting curing agents, imparting high chemical and solvent resistance and improved physical properties to the applied system. When cured under ambient conditions epoxy-polyamine coatings reach maximum physical properties in about four days, and maximum chemical resistance in seven days. These times can be accelerated by heat treatment. In epoxy coatings, aliphatic polyamines are generally used at or near stoichiometric concentration.

Major concerns of aliphatic polyamines include their high volatility, toxicity, tendency to blush during cure and inconvenient mix ratios which must be weighed very accurately. Blush can be reduced through the use of higher molecular weight amines and application under low humidity conditions. See the Dow technical bulletin entitled, Amine Blushing and Blooming of Epoxy Binder Systems, Form No. 296-01656.

Aliphatic polyamines can be modified to form a variety of other curatives, including polyamides, polyamine-adducts, amidoamines, ketimines and Mannich bases.

D.E.H. 24 Epoxy Curing Agent is a representative of the ethylene-diamine product family as indicated in the following table:

	D.E.H. 20	D.E.H. 24	D.E.H. 26	D.E.H. 29
	TETA Diethylene-triamine	TETA Triethylene-tetramine	TEPA Tetraethyle-nepentamine	Amine Mix
AHEW	21	24	27	29
Viscosity @ 25°C (mPa•s)	7	27	96	250
Use Ratio in phr with D.E.R.™ 331 Epoxy Resin	11	13	14	16
Gel Time at Room Temperature of 100 g binder (min)	≈ 25	≈ 25	≈ 26	≈ 24

Product Performance Data

Extensive product performance data for D.E.H. 24 Curing Agent in combination with several unmodified, as well as modified bisphenol A epoxy resins are shown in the Dow brochure entitled, *Dow Liquid Epoxy Resins*, Form No. 296-00224.

Product Stewardship

The Dow Chemical Company 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 then take the appropriate steps to protect employee and public health and the environment. The Dow Chemical Company has enduring commitments to Responsible Care® in the management of chemicals worldwide. Our Product Stewardship program rests with every individual involved with Dow products from the initial concept and research to the manufacture, sale, distribution, and disposal of each product.Customer Notice

Customer Notice

Dow encourages its customers and potential users of Dow products to review their applications for such products from the standpoint of human health and environmental quality. To help ensure that Dow products are not used in ways for which they were not intended or tested, Dow personnel are available to assist customers in dealing with ecological and product safety considerations. Your Dow sales representative can arrange for the proper contacts. Dow literature, including MSDS or SDS, should be consulted prior to the use of Dow products.

Medical Application Policy

Dow will not knowingly sell or sample any product or service (“Product”) into any commercial or developmental application that is intended for:

a. Permanent (long term) contact with internal body fluids or internal body tissues. Long term is a use which exceeds 72 continuous hours;
b. Use in cardiac prosthetic devices regardless of the length of time involved (cardiac prosthetic devices include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems and ventricular bypass assisted devices);
c. Use as a critical component in medical devices that support or sustain human life; or
d. Use specifically by pregnant women or in applications designed specifically to promote or interfere with human reproduction.

Additionally, all Products intended for use in pharmaceutical applications must pass the then current Pharmaceutical Liability Guidelines. For additional information please contact your regular Dow representative.

Food Contact Applications

When properly formulated and cured for food contact applications, this curing agent will comply with the U.S. Food, Drugs and Cosmetics Act as amended under Food Additive Regulation 21 CFR 175.300 (b)(3)(viii)(a); “Epoxy resins, as basic polymer”. This use is also subject to good manufacturing practices and any limitations specified in each regulation. Please consult the regulations for complete details.

If your applications include food contact requirements, please contact your Dow representative for further information and forthcoming EC regulations. Also consult the Dow data sheet, *Food Additive Status for Epoxy Resins, Curing Agents and Epoxy Novolac Resins*, Form No. 296-01425.

Regulatory Status

This aliphatic amine, triethylenetetramine (TETA) is listed under the number 292-588-2 as well as 203-950-6 on the European Inventory of Existing Chemical Substances (EINECS). There are two CAS number for this product, CAS registration number 90640-67-8 and CAS registration number 112-24-3. Both CAS numbers describe triethylenetetramine. In addition, Dow confirms that all the chemicals and intentional additives which form the basis of this product are listed on EINECS.

For more information on the regulatory status of this product, please refer to the MSDS or SDS for this product.

Chemical Inventory Listing

CAS Number[1]		**112-24-3 (90640-67-8)**
Europe	EINECS	203-950-6 (292-558-2)
United States	TSCA	112-24-3
Canada	DSL	112-24-3
Australia	AICS	112-24-3
Japan	ENCS	2-163
Korea	KECI	KE-2911
Philippines	PICCS	112-24-3
China	SEPA	112-24-3

[1] Please refer to the MSDS or SDS for this product to ensure this CAS number is consistent with the product(s) you use.

Safe Handling Information

The Dow Chemical Company provides its customers with a product specific Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) to cover potential health effects, safe handling, storage, use and disposal information. Dow strongly encourages its customers to review the MSDS or SDS on its products and other materials prior to their use.

This liquid amine curing agent is supplied in bulk or in 200 kg tight-head drums. Liquid polyamines are hygroscopic and may pick-up moisture and carbon dioxide from the atmosphere. See the Dow technical bulletin entitled, Amine Blushing and Blooming of Epoxy Binder Systems, Form No. 296-01656.

The material should be stored in its original closed packaging. Drums should be stored in a cool and dry place whereas a Nitrogen pad is recommended for bulk storage. Ground all transfer equipment and avoid contact with copper or copper bearing alloys. This liquid curing agent should retain its chemical properties for a period of at least 24 months.

For further handling information, consult the Dow brochure entitled, *DOW Epoxy Curing Agents Product Stewardship Manual, Safe Handling and Storage*, Form No. 296-01331 and the Dow technical bulletin, Product Coding, Shelf-life and Storage Stability, Form No. 296- 01657.

The Dow Chemical Company Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them MSDS on any hazardous products in their workplace.

The Dow Chemical Company sends MSDS on non-OSHA-hazardous as well as OSHA-hazardous products to its customers upon initial shipment, including samples. If you do not have access to one of these MSDS, please contact your local Dow representative for a copy.

Updated MSDS are sent upon revision to all customers of record. In addition, MSDS are sent annually to all customers receiving products deemed hazardous under the Superfund Amendments and Reauthorization Act.

MSDS should be obtained from suppliers of other materials recommended in this bulletin.

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