high performance catalysts for the formulation of single and multi-component systems

A129

boron triflouride monoethylamine [BF_3 MEA]

General Description

A129 - is a solid curing agent and/or accelerator for use with liquid and solid epoxy resins. Chemically it is a high purity complex of Boron triflouride and monoethylamine [BF3MEA].

A129 - may be used to homo-polymerise epoxy resins at elevated temperatures [catalytic cure] or in combination with other hardeners to accelerate the cure.

Applications

A129 - may be utilised in the formulation of single component epoxy systems that find use in a variety industries. It is especially suited to formulating epoxy systems that are used to manufacture laminate and pre-preg for electrical and structural [load bearing] applications.

Key Properties

- High degree of latency at ambient temperatures [in formulated systems]
- Excellent acceleration of cure with reduced post-cure temperature/time requirements when used as an accelerator
- Excellent mechanical, electrical and chemical resistance properties
- High heat distortion temperatures can be achieved

Specification

A129 - polymer specification and supplementary physical and handling properties. Table 1 provides details of some of the product characteristics. The values highlighted by the circular symbols [left hand column of table] are properties tested on a batch basis and reported in the certificate of analysis. All other properties are typical of batch manufacture and are for technical information only. They do not constitute a specification.

Table 1

	Physical Property		Units	Method (1)	Minimum	Maximum
•	Appearance - [To Defined Standard]	(2)	-	BSMT A 1001-001	ETS (3)	-
•	Colour	-	Gardner	BSMT A 1002-001	-	8
•	Viscosity	(4)	Poise	BSMT A 1003-005	85	95
•	Melting Range	-	°C	BSMT A 1004-003	78	100
-	Specific Gravity	(4)	Kg/litre	BSMT A 1010-002	1.00	1.08

Property key	
(1)	BSMT – Bitrez Standard Method of Test
(2)	FFFM – Free from Foreign Matter
(3)	ETS – Equal to Standard
(4)	Evaluated at 25°C/77F

Mix Ratio/Usage

A129 - may be employed as a catalyst for other curing agents or as a homo-polymerising curing agent. When used as a curing agent [ie not in conjunction with any other hardener] the mix ratio is variable but it is customary to utilise the product within the following range. Further information is available regarding use of this material as a co-curing agent or cure accelerator and our technical service personnel will be pleased to provide further details on request.

- **Mix Ratio** [PHR – Parts Per Hundred of Epoxy Resin with an EEW 190] – *by weight* **2 – 5**

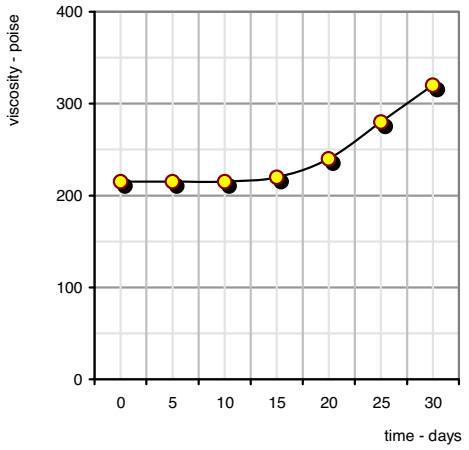
Preparation

A129 - may be formulated into single component systems with shelf lives of up to 6 months [storage at 5°C]. These systems can be prepared by dissolving the material in pre-heated epoxy resin at 85 – 90°C and then cooling to below 25C. Storage life can be extended by reduced temperature storage. Alternatively the material can be pre-dissolved in solvent for subsequent addition to epoxy systems. **A129 -** is readily soluble in ketones.

Figure 1 depicts the viscosity vs time at 25°C of a liquid epoxy resin modified with 3.5 PHR of **A129.**

[Viscosity evaluation is conducted at 25°C]

Figure 1
viscosity increase vs time [days]



Cure Schedules

Several cure schedules may be employed. Cure at a temperature of between 110 – 120°C is advised followed by post-cure operations. [Cure above 110 – 120°C can lead to excessive exotherm and reduced performance.] Initial gelation will occur after approximately 1 hour at this temperature. [Cure based on 3 PHR]

- **Key handling properties**

Activation temperature	**110°C**
Dissolution temperature	**82°C**

NB: Unfilled casting have a tendency to wrinkle at the surface exposed to air. – this phenomenon has not been explained but assumed to be a function of shrinkage due to the highly reactive nature of the material.

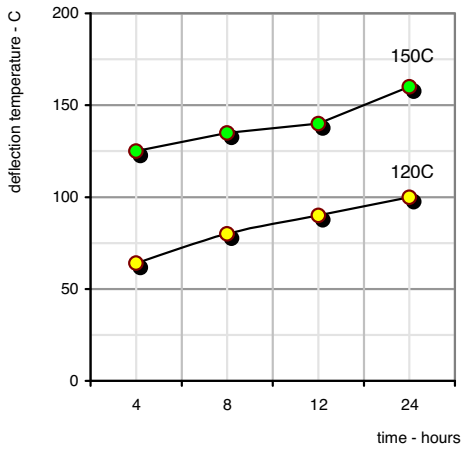
Post-Cure Schedules

Several post cure schedules may be employed. The following graph depicts the increase in deflection temperature following an initial 3-hour cure at 120°C. – [Cure based on 3 PHR.]

Recommended cure schedule is 3 hours @ 120°C followed by 1 hour @ 200°C.

Deflection temperature generation is depicted in the following graph based post cures of 120°C and 150°C

Figure 2
deflection temperature generation



Mechanical Properties

A129 - supplementary properties. All of the values quoted below are typical of batch manufacture and are for technical information only. They do not constitute a specification.

Table 2

	Mechanical Property	Units	Method (1)	Typical result
•	HDT	C	BSMT B 3005-001	Subject to cure – see figure2
•	Elongation	%	BSMT B 3006-001	2.6
•	Tensile Strength	N/mm2	BSMT B 3006-001	40
•	Tensile Modulus	N/mm2	BSMT B 3006-001	2800
•	Flexural Strength	N/mm2	BSMT B 3007-001	85
•	Flexural Modulus	N/mm2	BSMT B 3007-001	3200
•	Compressive Strength	N/mm2	BSMT B 3008-001	>100

Cure schedule employed for mechanical testing –Table 2

Initial cure	3 hours @ 120°C
Post cure	1 hour @ 200°C

Test pieces prepared with standard liquid epoxy resin [AH129] 100:3

Electrical Properties

A129 - supplementary properties. All of the values quoted below are typical of batch manufacture and are for technical information only. They do not constitute a specification.

Table 3

	Mechanical Property		Method (1)	Typical result
•	Dielectric Strength			17 Kv/mm
•	Volume Resistivity			1E15
•	Surface Resistivity			1E15
•	Dielectric Constant	60Hz		3.53
		1 KHz		3.47
		1 MHz		3.23
•	Dissipation Factor	60Hz		0.0029
		1 KHz		0.0052
		1 MHz		0.23

Cure schedule employed for mechanical testing – Table 3	
Initial cure	3 hours @ 120°C
Post cure	1 hour @ 200°C

Test pieces prepared with standard liquid epoxy resin [AH129] 100:3

Packaging

A129 - is supplied in 5 and 25 lt drums [Alternate packaging may be available upon request.]

Storage

A129 - should be kept in the original containers and sealed. Containers should be stored in a cool, dry place in compliance with the appropriate legislative controls.

Shelf Life

If stored in accordance with the guidelines provided this grade has a minimum shelf life of **6 months**. If material is held beyond this period of time then it should be evaluated to confirm that it remains suitable.

General

In the event that the system detailed herein does not satisfy any particular requirements, either in terms of the physical, mechanical or chemical resistance properties then we would be pleased to discuss alternative grades. In the event that further information is required, our technical sales staff will be pleased to establish if the information is available and offer assistance.

Health and Safety

Prior to using any material supplied by ebalta information should be sought from our general guidance notes and specific safety data reviewed from the Material Safety Data Sheets [MSDS]. MSDS information is periodically updated and revised copies will be forwarded as changes are made.

Notice

All information is based upon results gained from experience and is believed to be accurate but is given without acceptance of liability for loss or damage attributable to reliance thereon as conditions of use lie outside our control. Users should always carry out tests to establish the suitability of any products for their intended application. No statements shall be incorporated in any contract unless expressly agreed in writing nor construed as recommending the use of any product in conflict of any patent. All goods are supplied subject to Ebalta UK Limited's General Conditions of Sale.

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