Change Climate

Technical Data Sheet - Change Climate – CCBE Part A and Part B

Description

Change Climate Pty Ltd (CCPL) has developed CCBE – a two-part, clear, aliphatic, non-yellowing Bio-Epoxy Resin – made from a renewable, biological, glycerol core, unlike conventional diglycidyl ether Bisphenol A (DGEBA) epoxy resins, which are sourced from crude oil petrochemicals.

CCBE is available in two standard grades, CCBE-1 and CCBE-5.

Conventional DGEBA epoxy resins are based on a toxic Bisphenol A (BPA) core, which are aromatic, so yellow and chalk badly when exposed to ultraviolet (UV) radiation in sunlight. *This is **NOT** the situation for Change Climate's CCBE products.*

Bisphenol A (BPA) is the chemical core, used to manufacture most conventional epoxy resins, so BPA is likely to be present in residual quantities in these epoxy resins. BPA is an endocrine disruptor with major health concerns, especially for products that encounter food. In recent years, there has been a world-wide push to remove BPA containing products and plastics, from circulation and the environment. DGEBA epoxies, with their BPA core certainly fit into this category.

CCBE has a glycerol core, which is safely used in both the food and pharmaceutical industries. Glycerol is obtained from clean, green, environmentally friendly biofuel manufacture, so contains no BPA. Being manufactured from naturally occurring and renewable resources, CCBE-1 and CCBE-5 have low odour and zero volatile emissions.

When cured CCBE Bio-Epoxy resins are non-yellowing, clean, green, aliphatic and have physical properties that are often comparable, and sometimes exceed common BPA based, conventional DGEBA epoxy resin products.

As for most epoxy resins, CCBE Bio-Epoxy resins exhibit excellent adhesion to a variety of timber, concrete, metal and other substrates so can be used in a variety of applications directly replacing BPA containing DGEBA epoxy resins. Such applications include:

Building Industry: Adhesive applications; Clear and coloured coatings for construction and marine applications; Patching repair floor mortars; Bio-Epoxy wall renders; Vertical concrete, non-slump repair mortars; Green concrete; Hard wearing self-levelling and trowelable concrete screeds and Concrete waterproofing applications.
Art Supplies: As a resin to replicate a glass finish. Used as a medium for sculpture/moldings, laminates or inclusions;
Manufacturing Industry: In fiberglass products, such as marine craft and rainwater tanks; in plastics for car light or traffic light lenses; electrical circuit boards or composite materials.
DIY: A broad range of products from adhesives to water repelling sealants, feature finishes, and numerous hobby applications.
Recreational Sports: In snow and surf applications, marketable low environmental impact product. Applications for boards with positive rider feedback for light, hard, fast and responsive. Has a unique characteristic that does not feel like any other board on the market. A major benefit of CCBE Bio-Epoxy resins is the inherent flexibility of the cured resin that imparts hardness, combined with resilience and high impact resistance, not seen, with most BPA containing, conventional DGEBA epoxy resins.

Features	Benefits
BPA free	Safe
Low odour	Confined space use and earlier site re-entry
UV stable	UV stability and yellowing resistance
Low viscosity	Pourable/spreadable liquid
Renewable sourced ingredients	Green building material
Smooth, glossy or matt (with additives)	High surface finish, easy to clean
Self-levelling and seamless overcoat	Easy to use
Hard cure	Corrosion and abrasion resistant
Additives	Colour and texture
Manufacturing	Bulk manufacturing and fill available
Bulk cost	Comparable to existing epoxy resins
Applications	Coating, adhesive and moulding

Figure 1 Clear coat floor sealant – 2 X coat roller application

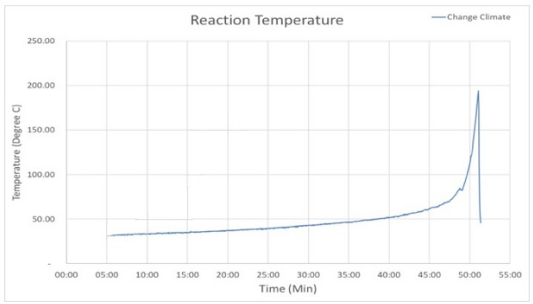
Typical Component Properties

Property	***CCBE-1 Part A***	***CCBE-5 Part A***	***CCBE - Part B***
Viscosity (cP @ 25^{O}C)	750 – 850 cP	6500 – 7500 cP	15 -20 cP
Density (kg/L @ 25^{O}C)	1.24– 1.25 kg/L	1.225 – 1.235 kg/L	0.92 – 0.95 kg L
EEW (g / equiv)	145 – 146 g/eq	168 – 170 g/eq	-
AHEW (g/eq)	-	-	42 – 43 g/eq

Typical Mix Properties

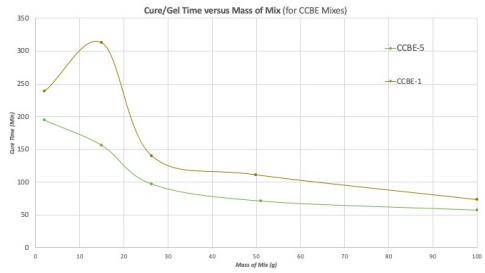
Mix Properties	***CCBE-1***	***CCBE-5***
Mix Ratio (by weight)	77.2 Part A : 22.8 Part B	79.8 Part A : 20.2 Part B
Mixed Ratio (by volume)	71.5 Part A : 28.5 Part B	74.8 Part A : 25.2 part B
Mixed Viscosity (cP @ 25^{O}C)	150 – 250 cP	2,300 – 2,450 cP
Mixed Density (kg/L @ 25^{O}C)	1.150 – 1.155 kg /L	1.150 – 1.155 kg /L
Pot Life (min for 100g @ 25^{O}C)	70 - 75 min	55 – 60 min
Tack free time (1 mm @ 25^{O}C)	230 - 250 min	190 – 210 min
Exotherm (^{O}C for 100g @ 25^{O}C)	> 175 ^{O}C	> 175 ^{O}C
Solids content %	100 %	100 %
Non-volatile material (NVM %)	0 %	0 %
Full Cure time (days @ 25^{O}C)	7 days	7 days

Typical Exotherm Profile of CCBE



Note: The precise time of exotherm depends on the mass of material cured and the ambient temperature

Typical gel time versus mass of CCBE



Note: The precise gel time will also depend on ambient temperature and humidity particularly when cured in thin films

Typical Cured Properties

Cured Property		***CCBE***
Compressive strength – unfilled (MPa)		87 ± 3 MPa
Compressive strength – sand filled (1:1 by vol – MPa)		108 ± 4 MPa
Glass Transition temperature - unfilled (Tg - ^{O}C approx.)		65 – 75 ^{O}C
Pencil Hardness (ASTM D3353)		8H to 9H
UVA - ASTM G154 (UV / Humidity @ 24 hours)		No deterioration
Mandrel Bend test - ISO 1519 (thin film)		No cracking > 10 mm
Flooring Fire test - AS/ISO 9239.1 (2003)		
Critical Heat Flux (CHF) – non directional		7.1 ± 1.9 kW/m^2
Smoke value – non directional		8 ± 3 %
Melting		Yes
Blistering		Yes
Penetration of flame through to substrate		Yes

Typical Chemical Resistance Properties

Thermal Properties		No decomposition at 100°C over three weeks (University of South Australia testing).
Electrical Properties		Untested
Renewable Properties		Primary ingredients from renewable sources.
Chemical Resistance	Acid	Acids pH < 4 cause weakening of epoxy resins, therefore Bio-epoxy resin is not recommended for long term exposure to acids.
	Base	Independent tests by the University of South Australia show very good resistance to alkaline environments. ➢ Stable in commercial bleach (NaOCl 5%) for 56 days ➢ Stable in very caustic environments (NaOH 12-14 M)
	Oxidiser	Remained intact for several weeks of constant exposure to commercial hydrogen peroxide (4% H_2O_2), became rubbery in week 8 but retained structure (University of South Australia study).

Application

CCBE is an unfilled, non-formulated Bio-Epoxy resin system, for general purpose Bio-Epoxy resin use. As such CCBE can be used for a wide variety of Bio-Epoxy applications.

CCBE can be used, unfilled as a low viscosity adhesive; or filled with fine powder to convert into a gap filling adhesive paste. It can be used with glass fibre and carbon fibre for reinforced resin systems such as surfboards, snowboards, skis and other sporting goods applications, requiring enormous strength properties. It can be used (as received) for clear or pigmented, floor coating systems; or as a Bio-Epoxy primer; or for low viscosity crack grouting applications in concrete. It can also be filled with graded silica sands to produce self-levelling and trowelable concrete flooring screeds. CCBE can also be used, following appropriate formulation, to produce non-slump concrete repair mortars, coving and renders. There are many other applications, for which CCBE can be used.

It is for this reason that Change Climate cannot provide detailed application information in this document, given the wide breadth of applications, which CCBE can be used. Change Climate therefore recommend that those seeking such high-level, technical and application information contact Change Climate directly for advice. See the Change Climate Technical Support statement at the end of this document.

Mixing

It is recommended that the epoxy resin is mixed in a 25L metal container.
Pre-measured hardener provided in Part B is added to the contents of Part A and mixed thoroughly using a manual paint mixer or low revolution mechanical mixer for at least 5 minutes scraping all surfaces of the container to ensure compete mixing.
Allow the reaction to start before application, usually within 10 minutes depending on ambient temperature.

Note: All ingredients must be thoroughly and intimately mixed to achieve maximum hardness. When the Part B hardener is added, it reacts with the Bio-Epoxy resin (Part A). The reaction generates heat so should not be left unattended, during the application and applied well within the usable pot-life of the material. Refer to CCBE-1 and CCBE-5 pot life data provided in this document in relation to projected pot-life and mass of mixed material.

General Comments:

- CCBE-5 has a faster gel time than CCBE-1; but releases less heat energy than CCBE-1
- Slower gel-times result from smaller batches of mixed CCBE material, but smaller batches will also release less heat of reaction.
- Place all the mixed material well before gelation time is reached
- Keep any unused material to a minimum to prevent unexpected heat exotherm
- Place any unused material in aluminum trays and in thin layers (< 25 mm thick)
- Mix only the amount of CCBE material intended to be placed
- Exotherm temperatures can exceed 175 – 200^{O}C for material exceeding 100g
- As a general rule gelation time roughly halves for every 10^{O}C rise in mix temperature
- It is unwise to use CCBE if temperature is less than 10^{O}C or greater than 30^{O}C

Cleaning

Remove from clothes, tools and equipment with methylated spirits, mineral turpentine or acetone before setting. Tacky surfaces can be cleaned with methylated spirits and cured material can only be removed mechanically.

Personal Protective Equipment

- Wear appropriate eyeglasses or chemical safety goggles.
- Wear appropriate gloves to prevent skin exposure.
- Wear appropriate clothing to prevent skin exposure.
- Use approved respirator when necessary.
- Use of an approved Barrier Cream suitable for use with epoxy resins, to reduce the likelihood of contracting dermatitis is also strongly recommended

Handling Precautions

- Refer to Change Climate's Material Safety Data Sheet (MSDS) for handling precautions
- CCBE – Part A can absorb up to 8% by weight moisture from the atmosphere. This can greatly accelerate setting times and reduce end-product performance. It is recommended to keep unused Part A material sealed from air when not in use.

- CCBE – Part B can absorb moisture and carbon dioxide from the atmosphere, which can reduce end-product performance. It is recommended to keep unused Part B material securely sealed from air when not in use.
- Application in condition of high humidity (> 70-80%) can cause the surface of clear applications and clear coatings to turn cloudy, and it is not recommended to apply CCBE for such applications in high humidity conditions. If cloudiness does occur you may need to contact Change Climate for further advice.

Storage

- It is advisable to use Part A within 2 months in well-sealed, airtight containers. Longer shelf storage life is available subject to formulation change on demand.
- It is advisable it use Part B several months
- Store Part A and Part B in a dry place at 10°C - 30°C in original, unopened containers

Technical Support

Change Climate offers a comprehensive technical advice and service to customers seeking advice for use of CCBE. In addition, Change Climate offers a technical support package to specifiers, end users and contractors, as well as on-site technical assistance.