

# Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## **GRAPHENO ADMIXTURES for CONCRETE:** **Precast Graphene Fluid Ultra;** **Precast Graphene Fluid G100**



From **Graphenano Smart Materials SL**

Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
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*An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at [www.environdec.com](http://www.environdec.com)*



## General information

### Programme information

<b>Programme:</b>	The International EPD® System
<b>Address:</b>	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
<b>Website:</b>	<a href="http://www.environdec.com">www.environdec.com</a>
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction products (EN 15804:A2) Version 1.2.5
PCR review was conducted by: PCR review was conducted by: The Technical Committee of the International EPD®System. See <a href="http://www.environdec.com/TC">www.environdec.com/TC</a> for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat <a href="http://www.environdec.com/contact">www.environdec.com/contact</a> .
Independent third-party verification of the declaration and data, according to ISO 14025:2006: <input checked="" type="checkbox"/> External <input type="checkbox"/> Internal Covering <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: Marcel Gómez, Marcel Gómez Consultoría Ambiental Accredited by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

## Company information

Owner of the EPD: **GRAPHENANO SMART MATERIALS S.L.**

Description of the organisation:

Graphenano Smart Materials was founded in 2015 as a subsidiary of Graphenano Group, involved in the development and application of graphene admixtures for advanced construction materials which greatly improve the mechanical performance, durability and resistance to external attacks, as well as the performance of the necessary raw materials.

Graphenano Smart Materials is a global pioneer in the manufacture of admixtures with graphene technology for advanced high performance, ecological building materials, such as high-performance and environmentally friendly special concretes and cements. Thanks to Graphenano's graphene, products improve the mechanical performance, quality and performance of conventional building materials.

Name and location of production site(s):

HORMINANO, S.L. C/ PABLO CASALS, 13  
30510 – YECLA- MURCIA (Spain)  
<https://www.graphenanosmartmaterials.com>

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## Product information

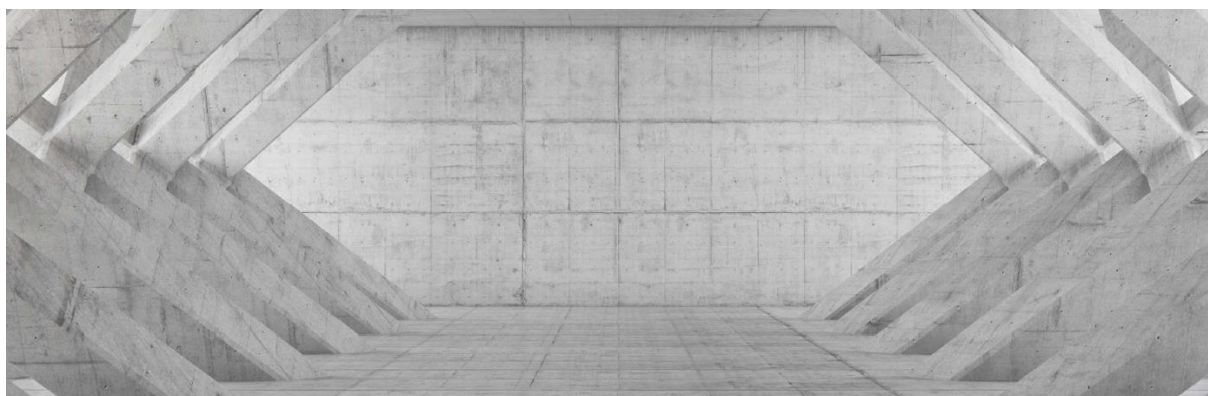
Product name: The analysed products are concrete admixtures, of the following references:

- Precast Graphene Fluid Ultra
- Precast Graphene Fluid G100

Product description: The analysed products are new generation high activity hyperplasticiser/water-reducing admixture designed with modified acrylic-based graphene technology, Graphene, a last generation nanotechnological material, is one of the allotropic forms in which carbon can be found, just as graphite or diamond, and therefore, it is abundant in nature. These admixtures are specially formulated for high performance precast concrete with high initial strengths, high workability even at low water/cement ratios and excellent surface finishes.

The admixtures with graphene content are liquid that are introduced in small amounts (< 5% by mass of the cement content) to concrete while it is being mixed and that enhance the properties of the fresh and/or hardened concrete.

Plasticizers and superplasticizers are admixtures which reduce the water content of mixed concrete without detriment to its consistency or enhance its slump with or without change to the water content or cause both effects simultaneously. They can also display a retarding effect when used as combination products.



*Example of product made from the products analysed*

The technical characteristics of the products are the following:

CHARACTERISTIC	
Aspect:	Yellowish cloudy liquid
Density, 20°C	1,058 ± 0,02 g/cm <sup>3</sup>
pH, 20 °C	5,3 ± 1
Viscosity 20 °C	< 90 cps
Chlorides	< 0,1 %
These technical data are derived from statistical results and do not represent guaranteed minimums. If control data is desired, the "Sales Specifications" can be requested from our Technical Department.	

UN CPC code: CPC 35499: Other chemical products; y, CN 3824 40 00: Prepared additives for cements, mortars or concretes.

## LCA information

**Declared unit:** The declared unit is the baseline reference for which all information is collected. In this study, the declared unit is “**1 kg of admixtures**”.

**Reference service life:** Not relevant for this EPD.

**Geographical scope:** The geographical scope of this EPD is global.

**Time representativeness:** The data collection from factory (primary data) and electricity mix are from 2021/01/01 to 2021/12/31. In this study, no datasets older than 10 years were used.

**Database(s) and LCA software used:** All the data used to model the process and obtain the Life Cycle Inventory are specific data and have been obtained by measurements made during the period from 2021/01/01 to 2021/12/31. They are representative of the different processes implemented during the manufacturing process. The data has been measured directly at the company's own premises. In addition, the most complete and highest quality European life cycle inventory database, Ecoinvent 3.8, has been used, as this database contains the most extensive and updated information and its scope coincides with the geographical, technological and temporal area of the project. The LCA was modelled with Simapro 9.3.0.3.

**Description of system boundaries:** According to the standard UNE-EN 15804\_2012+A2\_2020 (MARCH 2020) and PCR 2019:14 CONSTRUCTION PRODUCTS (version 1.2.5) the system boundary is cradle to gate (A1–A3). The optional life cycle stages A4-A5, B1-B7 are not included in this LCA study. In addition, all exception criteria are met, so the life cycle stages C1-C4 and D were excluded from the LCA study.

### System diagram:



### Manufacturing process:

Concrete admixtures are manufactured by mixing Graphene Master Base with other ingredients in batch mode and filling containers for dispatch.

### Author of the Life Cycle Assessment:

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48970 Basauri, Bizkaia (Spain)

### Data quality



The environmental impact of the concrete admixture has been calculated. It is based on the international standards established for the development of environmental product declarations, such as ISO 14025 for the preparation of the environmental product declaration, ISO 14040 and ISO 14044 for the preparation of the life cycle analysis, UNE-EN 15804:2012+A2:2020 (MARCH 2020) and the Product Category Rules PCR - "2019:14 Construction products " (Version 1.2.5).

Data has been collected from 2021/01/01 to 2021/01/31 and is representative of that year. Data for raw material supply, transport to fabrication plant and production (A1-A3) is based on specific consumption data for the factory at Yecla. In addition, for the data concerning some of the additives used in the mixture, the values reported in the "EPD-EFC-20210198-IBG1-EN Concrete admixtures – Plasticizers and Superplasticizers European Federation of Concrete" of the "Admixtures Associations a.i.s.b.l. (EFCA)" published by Institut Bauen und Umwelt e.V. (IBU) have been used.

Generic background datasets were used for the downstream processes. SimaPro v9.3.0.3. software was used to prepare the life cycle analysis together with the Ecoinvent 3.8 database. Characterization factors from EN15804: 2012 + A2:2019. The geographical coverage is global. Technological coverage is typical or average.

#### Assumptions

The modularity principle, as well as the polluter-payer principle have been followed. The following assumptions have been made in this EPD:

- ✓ It does not include the manufacturing processes of the capital goods or spare parts and/or maintenance with a life of more than three years.
- ✓ The environmental impact of infrastructure for general management, office, and headquarters operations is not included.
- ✓ Long term emission excluded.
- ✓ The impact caused by people (common activities, travel for work...) will not be considered.
- ✓ It does not include the consumption of natural gas for sanitary hot water from showers and heating system for the comfort of people.
- ✓ The processes associated with fuel production are intrinsically included in the indicators in ECOINVENT's database used in carrying out the LCA.
- ✓ The environmental impact of external transport has been calculated using lorries from the ECOINVENT 3.8 database, EURO 5. These lorries have been selected to reflect the most realistic scenario possible.
- ✓ It follows the three criteria defined by the EN15804 standard that enables "Cradle to gate" EPDs.

#### Cut-off rules

The standard ISO 14025 and the PCR -"2019:14 CONSTRUCTION PRODUCTS" indicate that the life cycle inventory data should include a minimum of 95% of the total inputs (materials and energy) for each stage. This cut-off rule does not apply for hazardous materials and substances. No such cut-off criteria have been taken into account in this study.

#### Allocation

Where necessary, such as waste generation and energy consumption, an allocation based in mass has been used.

#### Greenhouse gas emission from the use of electricity in the manufacturing phase

Specific electricity mix, medium voltage (direct emissions and losses in grid) 100% renewable electricity is considered for the manufacturing process.

Electricity mix	Amount	Units
Specific electricity mix	5,02E-02	Kg CO2-eqv/kWh

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage	
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential	
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	EU	EU	EU	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Specific data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ND: Not declared

## Content information

Components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Aqueous base	7,50E-01	0,00%	0,00%
Polycarboxylate	4,50E-01	0,00%	0,00%
Melamine sulphonate	4,50E-01	0,00%	0,00%
Naphthalene sulphonate	4,00E-01	0,00%	0,00%
Lignosulphonate	4,00E-01	0,00%	0,00%
Polyarylether	3,50E-01	0,00%	0,00%
Na-gluconate	3,50E-01	0,00%	0,00%
Graphene material	5,00E-02	0,00%	0,00%
Additives	5,00E-02	0,00%	0,00%
TOTAL*	3,20E+00	0,00%	0,00%

\*For reasons of confidentiality of the formula, the maximum % of each of the components of the product has been chosen so that the total sum does not correspond to the actual weight of the declared product.

**Packaging:** The product is transported in tanker trucks to the construction site.

No substances included in the Candidate List of Substances of Very High Concern for authorization under REACH Regulations are present in the concrete admixture manufactured by Graphenano Smart Materials, either above the threshold for registration with the European Chemicals Agency or above 0,1% (wt/wt).

## Environmental Information

Life cycle impact assessment results are relative expressions and do not predict final impacts by category, threshold exceedances, safety margins or risks.

### Potential environmental impact – mandatory indicators according to EN 15804:

Results per declared unit		
Indicator	Unit	A1-A3
GWP-fossil	kg CO <sub>2</sub> eq.	1,56E+00
GWP-biogenic	kg CO <sub>2</sub> eq.	3,13E-02
GWP-luluc	kg CO <sub>2</sub> eq.	6,16E-04
GWP-total	kg CO <sub>2</sub> eq.	1,59E+00
ODP	kg CFC 11 eq.	2,73E-09
AP	mol H <sup>+</sup> eq.	2,15E-03
EP-freshwater	kg PO <sub>4</sub> <sup>3-</sup> eq.	4,41E-06
EP-freshwater	kg P eq.	1,44E-06
EP-marine	kg N eq.	1,87E-03
EP-terrestrial	mol N eq.	6,09E-03
POCP	kg NMVOC eq.	1,77E-03
ADP-minerals&metals*	kg Sb eq.	3,98E-07
ADP-fossil*	MJ	2,94E+01
WDP	m <sup>3</sup> deprive	1,96E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption	

\* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

### Potential environmental impact – additional mandatory and voluntary indicators

Results per declared unit		
Indicator	Unit	A1-A3
GWP-GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	1,55E+00

### Use of resources

Results per declared unit		
Indicator	Unit	A1-A3
PERE	MJ	2,20E+00
PERM	MJ	1,57E-01
PERT	MJ	2,36E+00
PENRE	MJ	2,37E+01
PENRM	MJ.	5,62E+00
PENRT	MJ	2,94E+01
SM	kg	0,00E+00
RSF	MJ	0,00E+00
NRSF	MJ	0,00E+00
FW	m <sup>3</sup>	6,04E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water	

<sup>1</sup> The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.



## Waste production

Results per declared unit		
Indicator	Unit	A1-A3
Hazardous waste disposed	kg	7,34E-07
Non-hazardous waste disposed	kg	3,07E-02
Radioactive waste disposed	kg	6,63E-04

## Output flows

Results per declared unit		
Indicator	Unit	A1-A3
Components for re-use	kg	0,00E+00
Material for recycling	kg	2,39E-05
Materials for energy recovery	kg	0,00E+00
Exported energy, electricity	MJ	0,00E+00
Exported energy, thermal	MJ	0,00E+00

## Information on biogenic carbon content

Results per declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0,00E+00
Biogenic carbon content in packaging	kg C	3,20E-03

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO<sub>2</sub>.

## Additional information

The technical datasheet and the safety datasheet can be found in the following webpage:

<https://www.graphenanosmartmaterials.com/en/inicio/>

## Information related to Sector EPD

This is an individual EPD®

## Differences versus previous versions

This is the first version of the EPD®.

## References

- General Programme Instruction of the International EPD®System. Version 4.0.
- ISO 14020:2000 Environmental labels and declarations-General principles.
- ISO 14025:2010 Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures.
- ISO 14040:2006 Environmental Management-Life Cycle Assessment-Principles and framework.
- ISO 14044:2006 Environmental Management-Life Cycle Assessment-Requirements and guidelines.
- PCR 2019:14 Construction products (EN 15804: A2) version 1.2.5
- EN 15804:2012+A2:2019 Sustainability of construction works-Environmental Product Declarations-Core rules for the product category of construction products
- LCA report GRAPHENE MASTER BASE, PRECAST GRAPHENE FLUID G100 and PRECAST GRAPHENE FLUID ULTRA V.1.0 (23 December 2023).

