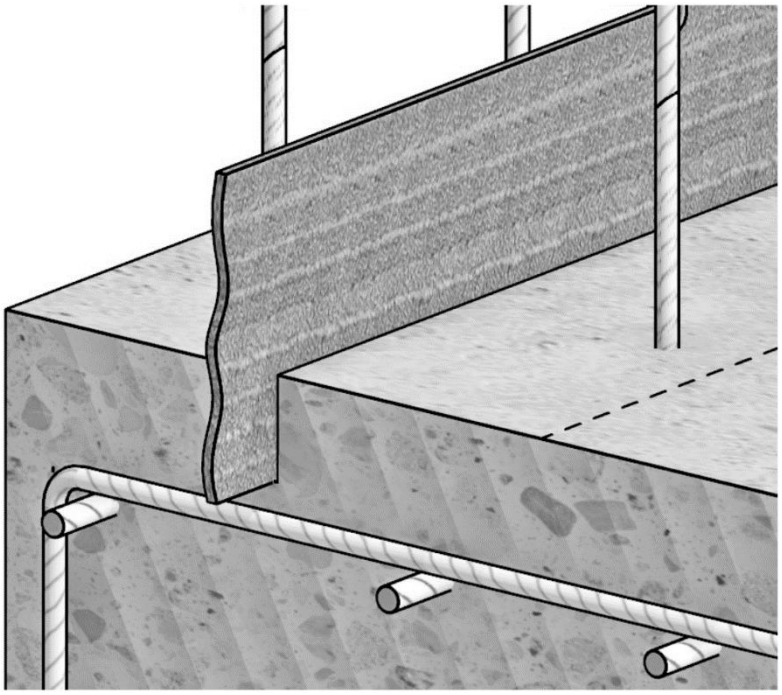
Environmental Product Declaration (EPD)

according to ISO 14025 and EN 15804+A2

Owner of the declaration:	BPA GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-BPA-238-EN
Issue date:	14.11.2022
Valid to:	14.11.2027



BPA-CEMflex® composite and sealing sheet CEMflex VB and CEMflex AVS

This EPD is based on the life cycle assessment of the BPA-CEMflex® composite and sealing sheet by BPA GmbH, which is manufactured at the company's own production site.

1. General information

BPA GmbH

BPA-CEMflex® composite and sealing sheet CEMflex VB and CEMflex AVS

Programme operator
Kiwa-Ecobility Experts
Voltastr. 5
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Germany

Owner of the declaration
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71083 Herrenberg-Gültstein
Germany

Registration number
EPD-BPA-238-EN

Declared product / declared unit
1 m² composite and sealing sheet

Issue date
14.11.2022

Valid to
14.11.2027

Scope
This EPD is based on the life cycle assessment of the BPA-CEMflex® composite and sealing sheet by BPA GmbH with the product ID CEMflex VB and CEMflex AVS, which is manufactured at the company's own production site.

The owner of the declaration is liable for the underlying information and evidence. Kiwa - Ecobility Experts is not liable for manufacturer information, life cycle assessment data and evidence.

Product category rules
PCR B for construction steel products (draft; 2020-03-13)

Verification:
The CEN standard EN 15804:2012+A2:2019 serves as the core PCR.
Independent verification of the declaration and data according to ISO 14025

☐internal ☒external

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2. Product details

2.1 Product description

The product to be declared is BPA-CEMflex® composite and sealing sheet with the product ID CEMflex VB and CEMflex AVS from BPA GmbH, which is manufactured at the company's own production site.

2.2 Application

The BPA-CEMflex® composite and sealing sheet with its patented special coating is used for joint sealing in concrete construction. The BPA-CEMflex® composite and sealing sheet has proven itself for years for sealing horizontal and vertical construction joints with pressing and non-pressing water (up to 8.0 bar). BPA-CEMflex® composite and sealing sheet can also be used when joining precast concrete parts. The excellent bond between the active special coating and the hardening fresh concrete reliably prevents migration of the BPA-CEMflex® metal waterstop system. A concrete embedment of only 3 cm is sufficient for reliable sealing. The BPA-CEMflex® composite and sealing sheet is water-reactive and thus actively seals construction and predetermined crack joints through a natural concrete technological process.

Areas of application:

- Concrete sealing constructions for pressing and non-pressing water
- Working joint in wall/sole area; wall/wall, floor/floor area or wall/ceiling area
- Joints in precast elements: Wall/sole area, wall/ceiling area, corner joints or predetermined breaking points
- Sealing for installations handling substances hazardous to water (in accordance with WHG, AwSV and TRwS). Constructions: SFH facilities (facilities for the storage, filling and handling of substances hazardous to water), MSS SF (storage and filling facilities for manure, slurry and silage effluent) and biogas plants, as well as mobile silo plant.
- Integral sealing against radon gas

2.3 Technical data

The following technical data was provided by BPA GmbH.

Table 1: Technical data on BPA-CEMflex® composite and sealing sheet

Parameter	Value
Dimensions	Width: 100mm to 250mm; Thickness: 0.68mm Length: up to 2500 mm
Product ID	CEMflex VB and CEMflex AVS
Steel grade	Galvanised thin sheet
Yield strength	≥ 140 N/mm²
Rm/Re ratio	approx. 2.0 - 1.4
Colour/type of coating	"black", "grey" or "red"
Type of coating order	double-sided, ribbed
Standard/Norm	DIN EN 10152/10131

2.4 Production

The composite and sealing sheet is delivered to the production site as galvanised thin sheet, coated on site and then packed for transport. The coating is mixed in production, applied to the galvanised thin sheet and dried on the product after application.

2.5 Raw materials

In Table 2 the raw materials for the production of the composite and sealing sheet are listed with the average proportions in mass percent. In order to protect commercial secrets, the values are given in intervals representing the distribution of the proportions of raw materials and aggregates.

Table 2 : Raw materials and aggregates in mass percent for the reference year 2021

Raw material/ aggregates	Share in m%
Steel	90-94
CEMflex coating	6-10

2.6 Reference service life (RSL)

As the service life of reinforcing steel is not taken into account, there is no need to specify a reference service life.

3. LCA: Calculation rules

3.1 Declared unit

The declared unit according to PCR B for construction steel products (draft; 2020-03-13) is 1 m² of composite and sealing sheet. Further information regarding the choice of the declared unit is included in the background report.

Parameter	Value	Unit
Declared unit	1	m²
Weight per declared unit	6.29	kg

For the calculation of potential environmental impacts, process-specific data was collected for the product under consideration. All the energy and materials required for extraction were determined, as were the data for calculating the auxiliary materials and by-products.

In this EPD, the product group "BPA-CEMflex® composite and sealing sheet" is considered. The product group refers to the end product composite and sealing sheet with the different coatings "black", "grey" or "red".

This EPD is valid for the products of the product group "BPA-CEMflex® Bonded and Sealed Sheet" with the following coating systems:

Colour/type of coating	Pigment for the production of the coating
black	Black pigment
grey	Black pigment
red	Red pigment

Furthermore, this EPD corresponds to a product-specific EPD for the product "BPA-CEMflex® composite and sealing sheet black". Further information can be found in the background report.

3.2 System boundaries

The EPD was prepared in accordance with DIN EN 15804+A2 and takes into account the manufacturing phase and parts of the disposal phase as well as the benefits and loads outside the system boundaries. According to DIN EN 15804, this corresponds to the product phases A1-A3, C1-C4 and D. The type of EPD is therefore "from stretcher to factory gate with options".

In this life cycle assessment according to ISO 14025, the following phases of the product life cycle are considered:

- A1: Raw material extraction and processing and processing processes of secondary materials serving as input, (e.g. recycling processes).
- A2: Transport to the manufacturer
- A3: Production
- C1: Abort
- C2: Transport to waste treatment
- C3: Waste treatment for reuse, recovery and/or recycling

- C4: Disposal
- D: Reuse, recovery and/or recycling potentials, indicated as net flows and benefits.

For the declared life cycle phases, all inputs (raw materials, intermediate products, energy and auxiliary materials) as well as the waste produced were considered. Figure 1 is the simplified process flow diagram for the product BPA-CEMflex® composite and sealing sheet with the product ID CEMflex VB and CEMflex AVS from BPA GmbH, which is manufactured at the company's own production site.

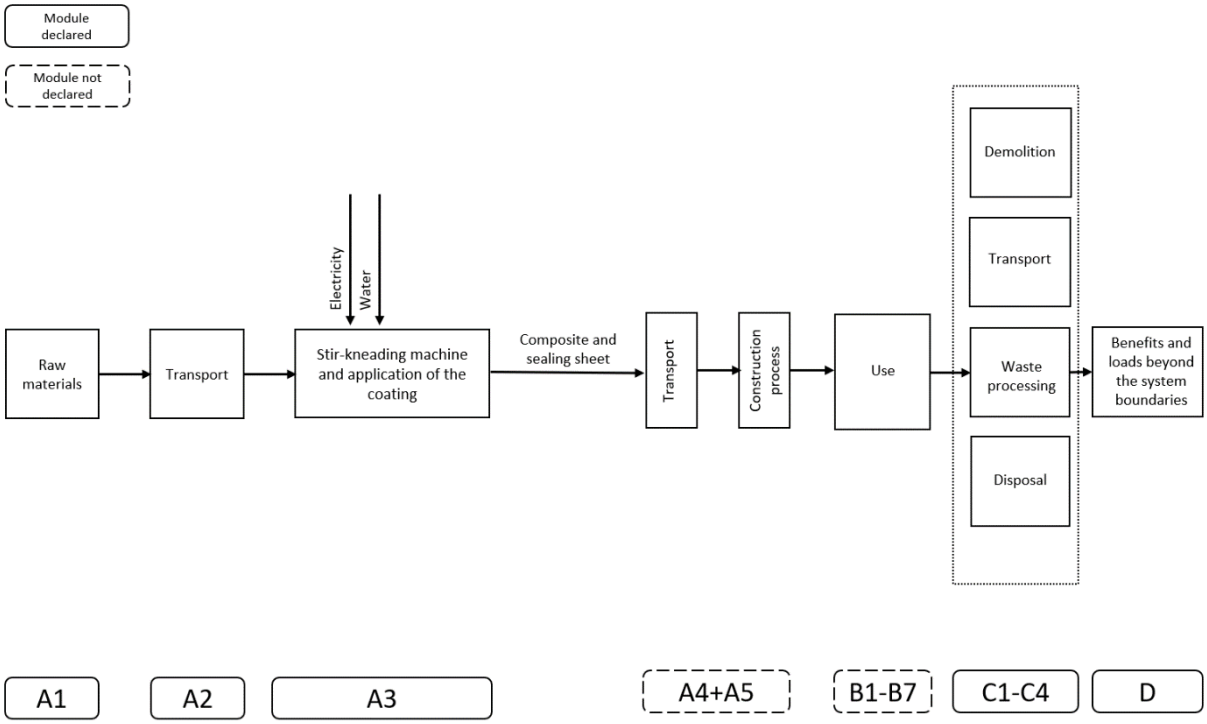

Figure 1: Simplified process flow diagram

3.3 Period under review

All product- and process-specific data were collected for the operating year 2021 and are thus up-to-date.

3.4 Cut-off criteria

All process-specific data were collected for process modules A1 to A3. Potential environmental impacts were assigned to the material flows based on the Ecoinvent database V3.6 of 2019. All flows contributing to more than 1 percent of the total mass, energy or environmental impacts of the system were considered in the LCA. It can be assumed that the neglected processes would have contributed less than 5 percent to the impact categories considered. Further information on cut-off criteria is explained in the background report.

3.5 Data quality requirements

To ensure the comparability of the results, only consistent background data from the Ecoinvent database V3.6 of 2019 was used in the LCA (e.g. data sets on energy, transports, auxiliary and operating materials). The database is regularly checked and thus complies with the requirements of EN 15804

(background data not older than 10 years). Almost all consistent data sets contained in the Ecoinvent database V3.6 of 2019 are documented and can be viewed in the online documentation.

The data refer to the annual average of inputs (energy, operating materials, etc.) consumed during the operating phase 01/2021 - 12/2021 and were converted into reference flows (input / output per declared unit).

The general rule was followed that specific data from specific production processes or average data derived from specific processes must have priority in the calculation of an LCA. Data for processes over which the manufacturer has no influence were assigned generic data.

The LCA was calculated using Nibe's online EPD tool "R< THiNK".

3.6 Allocations

The allocation regarding production waste is explained in the background report. Specific information on allocations within the background data can be found in the documentation of the Ecoinvent database V3.6 of 2019.

3.7 Comparability

A comparison or evaluation of EPD data is only possible if all data sets to be compared have been created according to EN 15804 and the building context or the product-specific performance characteristics are taken into account.

3.8 Data collection

ISO 14044 section 4.3.2 was taken into account in the data collection.

The objective and the scope of the study were defined in consultation with BPA GmbH. The data collection was carried out using an Excel data collection template provided by Kiwa GmbH. The collected data was checked by Kiwa GmbH, for example, by checking the extent to which the material balance was adhered to. In this way, some errors (e.g. unit errors, conversion factors) could be corrected in cooperation with BPA GmbH. Subsequently, the annual values were related to the declared unit of one square metre of composite and sealing sheet with the help of corresponding calculations.

3.9 Calculation method

For the life cycle assessment, the calculation procedures described in ISO 14044 section 4.3.3 were applied. The evaluation is carried out on the basis of the phases lying within the system boundaries and the processes contained therein.

4. LCA: scenarios and further technical information

The waste scenario "Steel, construction profiles" was assigned to the steel sheets used. The waste scenario is based on the "Nationale Milieudatabase" (NMD), the national environmental database of the Netherlands. This is due to the fact that the online EPD tool "R< THiNK" was developed by Nibe in the Netherlands. The waste scenario used for reinforcing steel has the NMD ID 70. Further information is listed in chapter 4 below.

Table 3: C2 - Transport for waste treatment

Waste scenario	Waste treatment type	Transport profile	Transport distance [km]
Steel, construction profiles (NMD ID 70)	Landfill	Lorry (Truck), unspecified (default)	100
	Combustion	Lorry (Truck), unspecified (default)	150
	Recycling	Lorry (Truck), unspecified (default)	50

Table 4: C4 - Proportions of waste treatment types

Waste scenario	Shares of waste treatment types [%]			
	Landfill	Recycling	Combustion	Reuse
Steel, construction profiles (NMD ID 70)	1	94	0	5

Table 5: D - Environmental profiles used for loads

Waste scenario	Environmental profile used for loads			
	Landfill	Recycling	Combustion	Reuse
Steel, construction profiles (NMD ID 70)	Scrap steel {Europe without Switzerland}| treatment of scrap steel, inert material landfill	Materials for recycling, no waste processing taken into account	-	Materials for re-use, no waste processing taken into account

Table 6: D - Environmental profiles used for credits

Waste scenario	Environmental profile used for credits			
	Landfill	Recycling	Combus-tion	Reuse
Steel, construction pro-files (NMD ID 70)	-	Benefits module D | World Steel method (Steel pro-duction, electric, low-al-loyed - Steel production, converter, unalloyed)	-	-

5. LCA: Results

The following tables show the results of the life cycle assessment, more specifically for the environmental impact indicators, resource consumption, output flows and waste categories. The results presented here refer to the declared unit of 1 m² of composite and sealing sheet.

The results of the environmental impact indicators ETP- fw, HTP-c, HTP-nc, SQP, ADP-f, ADP-mm and WDP must be used with caution, as the uncertainties in these results are high or there is limited experience with the indicator.

The IRP impact category mainly addresses the potential effect of low dose ionising radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposure, nor does it consider the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

Specification of the system boundaries (X = module declared; - = module not declared)																
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport to place of use	Construction / Installation	Use	Maintenance	Repair	Replacement	Conversion / Renewal	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse-, Recovery, Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	-	-	-	-	-	-	-	-	-	X	X	X	X	X

Results of the life cycle assessment - environmental impact indicators: 1 m² composite and sealing sheet									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
AP	mol H^+ -eq.	7,82E-02	9,79E-04	6,08E-04	0,00E+00	2,88E-04	9,56E-05	2,24E-05	-2,67E-02
GWP-total	kg CO_2 -eq.	1,54E+01	1,69E-01	-1,27E+00	0,00E+00	4,97E-02	1,07E+00	2,69E-03	-6,87E+00
GWP-b	kg CO_2 -eq.	-1,17E-03	7,80E-05	-1,51E+00	0,00E+00	2,29E-05	4,07E-05	1,19E-04	7,17E-02
GWP-f	kg CO_2 -eq.	1,54E+01	1,69E-01	2,32E-01	0,00E+00	4,97E-02	1,07E+00	2,57E-03	-6,94E+00
GWP-luluc	kg CO_2 -eq.	7,18E-03	6,19E-05	1,91E-03	0,00E+00	1,82E-05	1,99E-06	7,22E-07	5,09E-03
ETP-fw	CTUe	7,53E+02	2,27E+00	-8,21E+00	0,00E+00	6,68E-01	2,92E-01	3,32E-01	-2,32E+02
PM	Occurrence of diseases	1,26E-06	1,52E-08	5,09E-08	0,00E+00	4,47E-09	7,68E-10	4,61E-10	-4,00E-07
EP-m	kg N-eq.	1,51E-02	3,45E-04	2,93E-04	0,00E+00	1,01E-04	4,23E-05	8,27E-06	-4,95E-03
EP-fw	kg PO_4 -eq.	9,22E-04	1,70E-06	1,62E-05	0,00E+00	5,01E-07	1,37E-07	3,31E-08	-2,46E-04
EP-t	mol N-eq.	1,73E-01	3,80E-03	7,56E-04	0,00E+00	1,12E-03	4,69E-04	9,16E-05	-5,78E-02
HTP-c	CTUh	1,19E-07	7,37E-11	3,13E-10	0,00E+00	2,17E-11	1,38E-09	3,19E-12	-8,97E-10
HTP-nc	CTUh	5,45E-07	2,48E-09	9,75E-10	0,00E+00	7,31E-10	4,21E-09	2,60E-10	1,34E-06
IRP	kBq U235-eq.	3,70E-01	1,07E-02	1,39E-02	0,00E+00	3,14E-03	1,98E-04	3,43E-04	1,18E-01
SQP	-	5,57E+01	2,21E+00	1,05E+02	0,00E+00	6,50E-01	3,91E-02	1,69E-01	-1,07E+01
ODP	kg CFC11-eq.	7,95E-07	3,73E-08	2,77E-08	0,00E+00	1,10E-08	1,01E-09	9,25E-10	-1,74E-07
POCP	kg NMVOC eq.	7,42E-02	1,09E-03	1,43E-03	0,00E+00	3,19E-04	1,16E-04	2,62E-05	-3,92E-02
ADP-f	MJ	1,64E+02	2,55E+00	3,28E+00	0,00E+00	7,49E-01	9,27E-02	6,88E-02	-4,89E+01
ADP-mm	kg Sb-eq.	4,72E-03	4,28E-06	9,06E-06	0,00E+00	1,26E-06	8,47E-08	2,26E-08	-1,56E-05
WDP	m^3 World eq. withdrawn	4,27E+00	9,11E-03	3,93E-02	0,00E+00	2,68E-03	-4,45E-03	3,25E-04	-1,32E+00

AP = Acidification potential, accumulated exceedance;
GWP-total = Global warming potential, total;
GWP-b = Global warming potential, biogenic;
GWP-f = Global warming potential, fossil;
GWP-luluc = Global warming potential, land use and land use change;
ETP-fw = Ecotoxicity potential, freshwater;
PM = Particulate matter emissions;
EP-m = Eutrophication potential, fraction of nutrients reaching marine saltwater end compartment;
EP-fw = Eutrophication potential, fraction of nutrients reaching freshwater end compartment;
EP-t = Eutrophication potential, accumulated potential;
HTP-c = Human toxicity potential, cancer effects;
HTP-nc = Human toxicity potential, non-cancer effects;
IRP = Ionising radiation potential, human health;
SQP = Soil quality potential;
ODP = Depletion potential of the stratospheric ozone layer;
POCP = Formation potential of tropospheric ozone;
ADP-f = Abiotic depletion potential for fossil resources;
ADP-mm = Abiotic depletion potential for non-fossil resources, minerals and metals;
WDP = Water deprivation potential, deprivation-weighted water consumption

Results of the life cycle assessment - resource consumption, output flows & waste categories: 1 m² composite and sealing sheet									
Parameter	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,65E+01	3,19E-02	6,83E+00	0,00E+00	9,38E-03	3,57E-03	3,41E-04	-2,04E-02
PERM	MJ	3,31E-02	0,00E+00	1,33E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,65E+01	3,19E-02	2,01E+01	0,00E+00	9,38E-03	2,71E-03	3,88E-03	1,40E+00
PENRE	MJ	1,73E+02	2,70E+00	3,57E+00	0,00E+00	7,95E-01	6,52E-02	4,48E-02	-1,61E+00
PENRM	MJ	1,06E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	1,74E+02	2,70E+00	3,49E+00	0,00E+00	7,95E-01	1,01E-01	7,30E-02	-5,08E+01
SM	kg	6,01E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	1,22E-01	3,10E-04	1,78E-03	0,00E+00	9,12E-05	8,28E-05	8,58E-05	-2,50E-02
HWD	kg	1,59E-03	6,45E-06	1,49E-05	0,00E+00	1,90E-06	1,48E-06	8,46E-08	-8,28E-04
NHWD	kg	6,03E+00	1,62E-01	2,20E-01	0,00E+00	4,75E-02	1,80E-02	2,87E-01	-6,75E-01
RWD	kg	3,62E-04	1,67E-05	1,68E-05	0,00E+00	4,92E-06	2,61E-07	4,54E-07	4,04E-05
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	5,00E-02	0,00E+00	0,00E+00	5,44E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	3,69E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,30E-01
EEE	MJ	0,00E+00	0,00E+00	2,14E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,92E-01

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 resources;
SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Use of net fresh water;
HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed;
CRU = Components for re-use;
MFR = Materials for recycling;
MER = Materials for energy recovery;
EET = Exported thermal energy (thermic);
EEE = Exported energy, electric

6. LCA: Interpretation

For easier understanding, the results are presented graphically in order to be able to see correlations and connections between the data more clearly.

Figure 2 shows the percentage share of the product phases in the environmental impact categories for the EPD calculation of 1 m² of composite and sealing sheet.

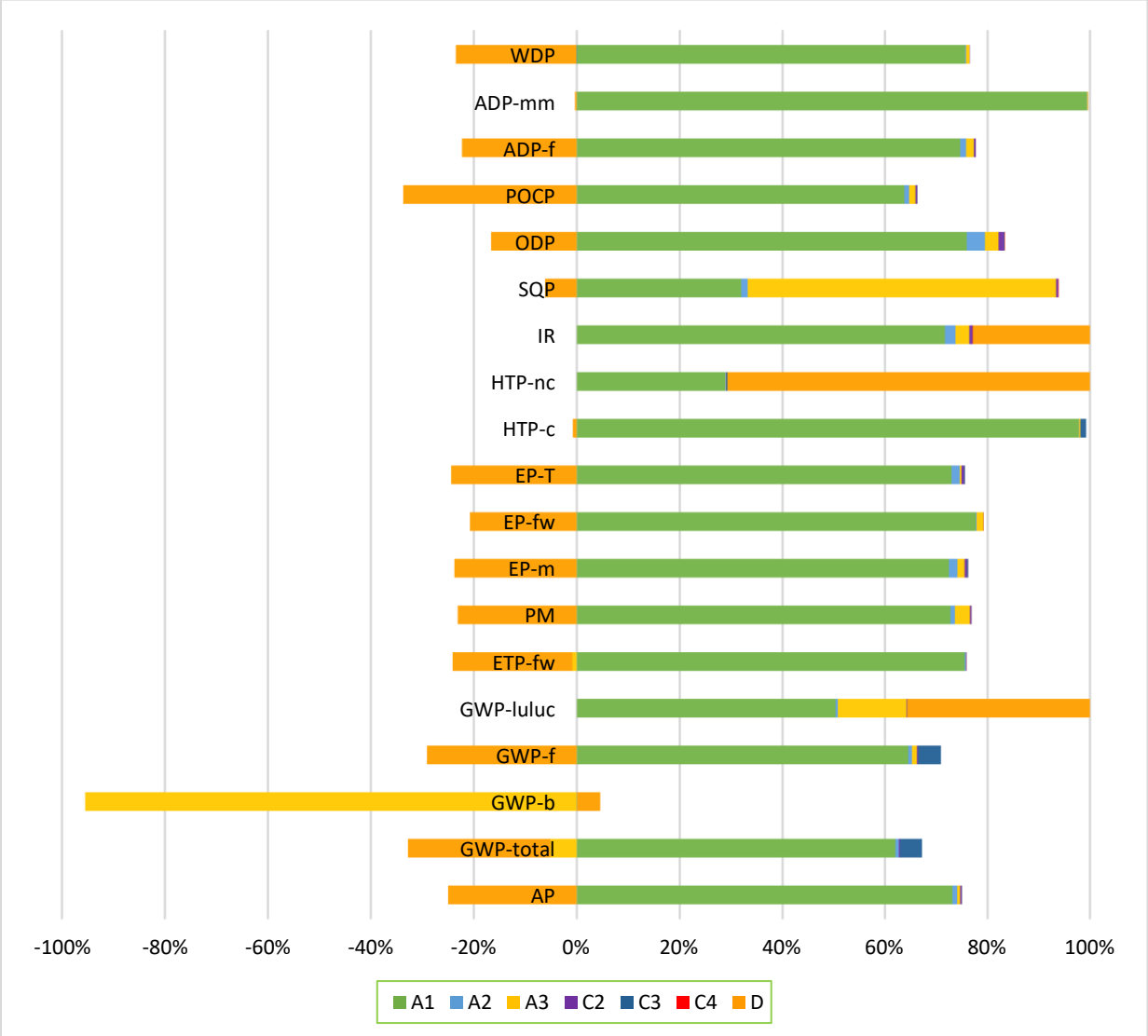

Figure 2: Shares of the product life phases in the environmental impact categories for BPA-CEMflex® composite and sealing sheet

In Figure 2 it can be clearly seen that in almost all environmental impact categories, raw material supply A1 has the largest share, followed by production A3.

Negative shares of the environmental impact "GWP-b" can be concluded from the use of the ecological material "wood", which binds CO_2 from the ambient air in the course of its service life.

7. Literature

Ecoinvent, 2019	Ecoinvent database version 3.6 (2019)
EN 15804	EN 15804:2012+A2:2019: Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
ISO 14025	DIN EN ISO 14025:2011-10: Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14040	DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006
ISO 14044	DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006
PCR A	General Program Category Rules for Construction Products from the EPD programme of Kiwa BCS Öko-Garantie GmbH - Ecobility Experts; Version 2.0
PCR B	Product Category Rules for steel construction products from the EPD programme of Kiwa BCS Öko-Garantie GmbH - Ecobility Experts; Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (draft)
R< THiNK, 2022	R< THiNK; online EPD tool from Nibe; 2022
SBK, 2019	SBK-verification protocol - inclusion data in the Dutch environmental database, Final Version 3.0, January 2019, SBK

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