Environmental Product Declaration

NEOKEM S.A. – PP652 (12-30% TiO2) Architectural Super Durable Smooth Matt Bonded Powder Coatings (Class 2)

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

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Date of Validity	2028-05-13
CPC	351 – Paints and varnishes and related products; artists' colours; ink

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.

Program Information

Program

The International EPD® System
EPD International AB, Box 210 60
SE-100 31 Stockholm, Sweden
www.environdec.com
info@environdec.com

Owner of the EPD

Headquarters & Production site:
95, Ag. Georgiou Str., GR 194 41
Koropi, Attiki
Greece P.O. BOX 143
T: +30 210 6626860
www.neokem.eu
info@neokem.gr

Product Category Rules (PCR): ISO standard ISO 21930 and CEN standard EN 15804 serve as the core Product Category Rules (PCR)	PCR 2019:14 Construction products version 1.2.5 (EN 15804:A2)
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Third Party Verification: Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Approved by: The International EPD® System Procedure for follow-up of data during EPD validity involves third-party verifier. ☐ Yes ☒ No	Dr-Ing. Nikolay Minkov GREENZERO AX GmbH nikolay.minkov@greenzero.me
Life Cycle Assessment Accountability:	SustChem Consulting S.A. www.sustchem.gr

- 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 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 characterization factors); have equivalent content declarations; and be valid at the time of comparison.
- For further information about comparability, see EN 15804 and ISO 14025.

Since 1972

NEOKEM
color performance

Company Profile

Established in **1972**, NEOKEM started the development and production of **high-quality coatings** that matched and even exceeded the expectations of our customers.

In **1987**, in a demanding environment for advanced high-tech products, we were **the first Greek company** to implement the production of **powder coatings** for aluminum architectural systems, industrial and other uses.

In **2006**, inspired by the market trends and motivated by our customers' particular needs, we produced **super durable powder coatings** with excellent resistance to adverse outdoor conditions.

Today, our business continues to grow along with our goals and expectations. We are a powder coating manufacturer with products that are internationally recognized and distributed.

50 years
Quality & Innovation in the Coatings Industry

Neokem has designed and developed a **Corporate Sustainability Strategy** in the context of climate change mitigation and circularity promotion. One part of this strategy is related to the precise quantification of the products' environmental impacts in order to supply the market with powder coatings that cause the least damage to the environment. Actions of the strategy include investing in RES and increasing energy efficiency, among others.

Further information on www.neokem.eu

Powder Coatings
Our Core Business

Powder coatings represents 95% of our turnover.

We make powder coatings that reflect the current market needs for superior quality, appearance, utility and durability, and environmental performance.

We offer the best solutions through our extensive product ranges, and we ensure the high quality of our products through Certifications.

Most of NEOKEM powder coatings series are approved according to **Qualicoat**, **Qualideco** by the European Aluminium Association, **GSB International**, and **Qualisteelcoat**.

Markets

During the last 20 years, we have established a dynamic international presence in more than 25 countries, including Germany, the Baltic States, South-Eastern Mediterranean, the Balkans and Russia, indicatively being among the regions where powder coatings are sold.

Aesthetics Built to Last

Architectural Applications

For over **30 years**, all our powder coatings have been produced in our state-of-the-art manufacturing facilities, consistently guaranteeing their high quality.

We draw inspiration from the market, designing and developing Powder Coatings which meet high standards in **Quality** and **Aesthetics**, in cooperation with well-known architects and interior designers.

The NEOKEM **Super Durable** powder coatings have been specially designed to withstand the high intensity solar radiation prevalent in Mediterranean Region.

Our Architectural Collections:

Prisma, Ammos, RAL Metallic and RAL Matt Polyester have been designed to meet the demands and preferences of contemporary architecture.

Main Applications: Facades, Doors, Windows, Blinds, Pergolas, Rails, Fences, Garage Doors.

Main Benefits of Super Durable powder coatings

- Excellent durability in outdoor conditions
- High resistance to scratches and abrasion
- Outstanding appearance
- Low dirt pick – up due to the especially designed surface
- Wide range of contemporary, classic and popular color shades
- Environmentally friendly

PP652 Cosmos

Architectural Super Durable Matt Smooth Bonded Powder Coatings

Product description

PP652 Cosmos is a new generation of Super Durable smooth matt powder coatings. Due to its superior weathering resistance – three years in Florida weather resistant – it is recommended for architectural and other demanding applications where gloss, color retention and long-term aesthetics are significant. PP652 is designed for architectural use, on aluminum and galvanized steel. It is recommended for architectural aluminum profiles, panels, railings, outdoor machinery and equipment, automotive parts etc.

All PP652 Cosmos products are heavy metal free and TGIC free. PP652 is approved by Qualicoat for Class 2 – Category 1 (Approval number: P-1653).

NEOKEM PP652 Powder Coatings conforms to Qualicoat Class 2 and GSB specifications. Some of PP652 Powder Coatings properties are declared in the following table.

Colour	RAL
Gloss (ISO 2813/60^0)	30 ± 5
Density (ISO 8130-3)	1.38 ± 0.2 g/ cm^3 (depending on colour)
Curing conditions	15 minutes at 190^{o}C

Technical data

Indicatively, some physicochemical performance data of a representative PP652 Powder Coating is presented.

Mechanical Property	Value
Adhesion (EN ISO 2409, 2mm)	Gt = 0
Bend Test (EN ISO 1519)	Pass 5 mm
Erichsen Cupping (EN ISO 1520)	> 5 mm
Direct impact (EN ISO 6272-1, EN ISO 6272-2, ASTM D2794)	> 2.5 Nm
Indentation Buchholz (EN ISO 2815)	> 80

Corrosion Test – Chemical Property	Value
Sulphur dioxide test in a humid atmosphere (ISO 22479)	Pass 24 cycles
Acetic Acid salt spray (EN ISO 9227)	Pass 1000 hours
Resistance to mortar (ASTM D3260, EN12206-1)	Pass 24 hours
Condensation water test (EN ISO 6270-2)	1000 hours, no blistering

Weathering Test	Value
Natural weathering 12 months Florida 5 South (ISO 2810)	> 50% gloss retention
Accelerated Weathering test EN ISO 16474-2 (Qualicoat cycle)	> 90% gloss retention after 1000 hours

PP652 Architectural Super Durable Matt Smooth Bonded Powder Coatings

Base materials

PP652 (12-30% TiO2) Powder Coatings manufactured at Neokem's plant in 95, Ag. Georgiou Str., GR 194 41 Koropi, Attiki, consist of the following materials as defined in the table on the right. The contribution of each material is presented in ranges of % w/w.

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH Regulations are present in the company's products, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/ wt).

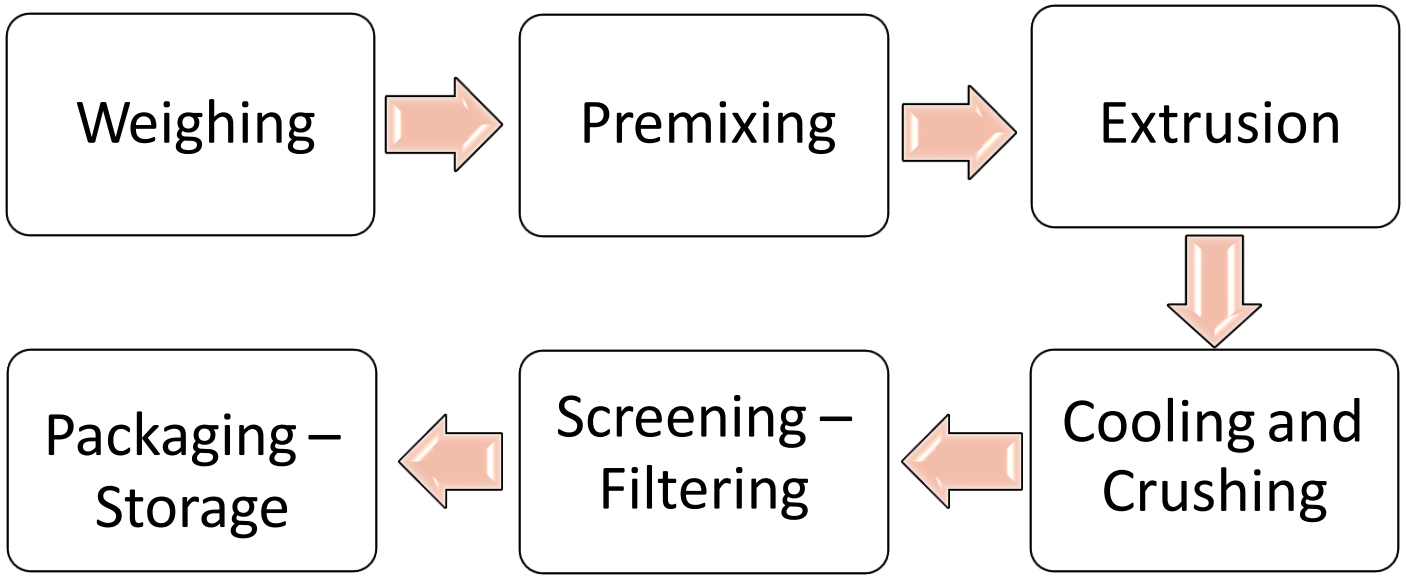
PP652 (12-30% TiO2) Powder Coatings		
Contribution (% in weight) of materials to the declared unit – 1 kg of Powder Coating		**Biogenic content (kg C)**
Titanium dioxide (TiO2)	12.0 – 30.0	-
Binders	57.0 – 77.0	-
Pigments	0.1 – 0.2	-
Fillers	6.0 – 8.0	-
Additives	2.0 – 5.0	-
Packaging Material		
	Mass (kg)	**Biogenic content (kg C)**
Carton box	0.030	3.20E-04
Plastic bag (MDPE)	0.00322	-
Stretch film	2.50E-04	-
Wood pallet	0.025	0.0129

Grouping multiple products in the same EPD

Products manufactured by Neokem in a single manufacturing site with the same major steps in the core processes under the code name "PP652 Powder Coatings" may be grouped and thereby are included in the same EPD. Therefore, for each indicator, the highest result of the included products is declared according to the worst-case-scenario approach. The formulation with the highest concentration of titanium dioxide is selected for the purposes of the LCA study, representing the worst-case scenario.

Manufacturing Process

PP652 Architectural Super Durable Matt Smooth Bonded Powder Coatings (Class 2)



During the weighing phase, all the necessary raw materials are weighed based on the recipes of the products. Then the raw materials are premixed, and they are guided to the extruder. The operating conditions of the extruder are adjusted accordingly so that they are the same as those listed in the recipe depending on the manufactured product. The melt leaving the extruder automatically flows onto a conveyor belt and is cooled to a temperature of about 20-25 0C. After the conveyor belt, the melt in the form of chips is transferred to the powder mills where it is ground into powder. Finally, the manufactured powder coatings are controlled under the responsibility of the quality assurance and control officer, and they packaged in 25kg carton boxes.

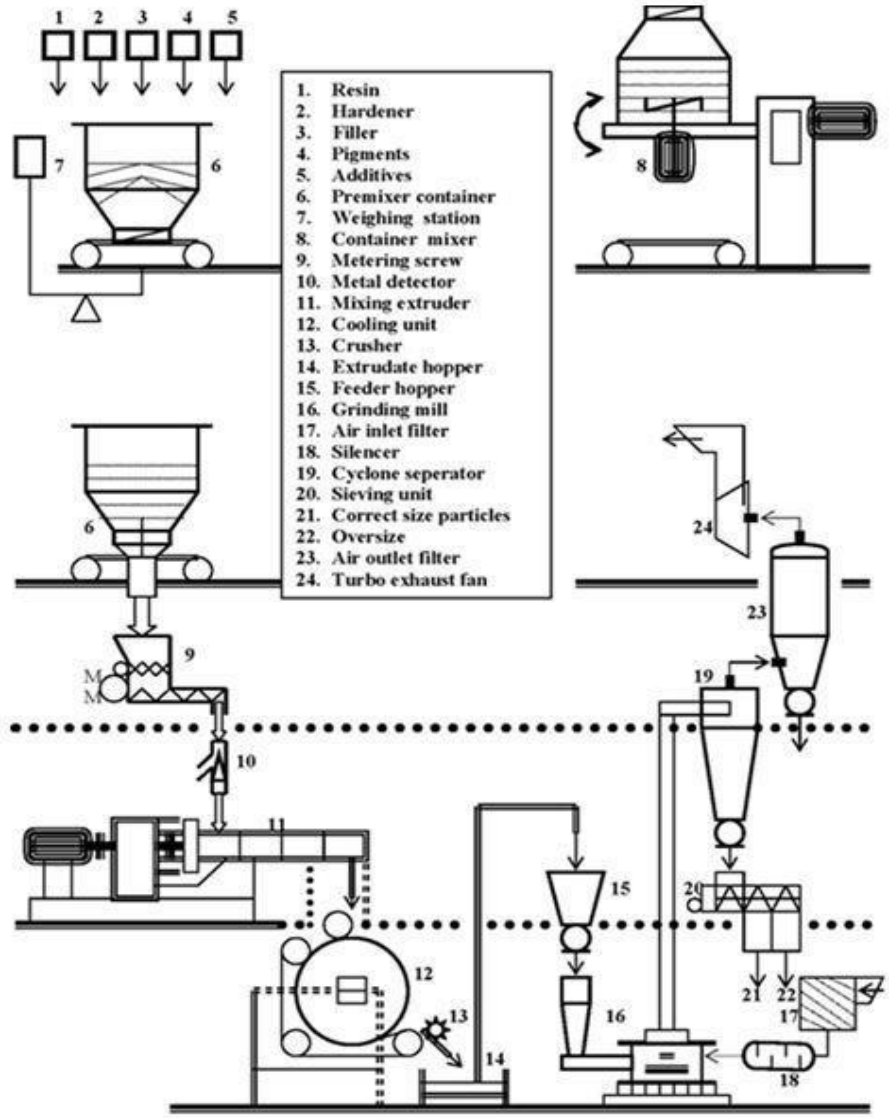


Figure 1.

Description of examined Modules

Declared Unit

The declared unit is 1 kg of PP652 Powder Coating. Packaging weight is taken into account but is not included in the 1 kg of the declared unit.

System boundaries

This EPD covers the **cradle-to-gate with options** approach. Therefore, the defined system boundaries include modules A1-A3 & A4.

Powder coatings are eligible for the exclusion of Life Cycle Modules C and D according to PCR.
End of life scenarios for powder coatings can be found in EPDs for coated products, such as aluminium profiles or other surfaces.

Reference Period Considered

January 2021 – December 2021

EPD TYPE

SOFTWARE

Specific

DATABASE

GaBi ts version 10.6.0.110

Ecoinvent 3.8.1 & Professional 2021

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource Recovery Stage
	Raw material	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction, demolition	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling potentials
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND
Geography	EU-27	EU-27	GR	EU-27													
Specific data used		> 50%		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Geographical representation for Modules A1-A3 is only for Europe due to the modelling of EU-27 process datasets.

**MND: Module Not Declared*

Description of examined Modules

A1: Raw Material Extraction and Production

Module A1 includes the production of all raw materials and utilities (i.e., electricity, water, etc.) required in the manufacturing process.

A2: Transport to Neokem Facilities

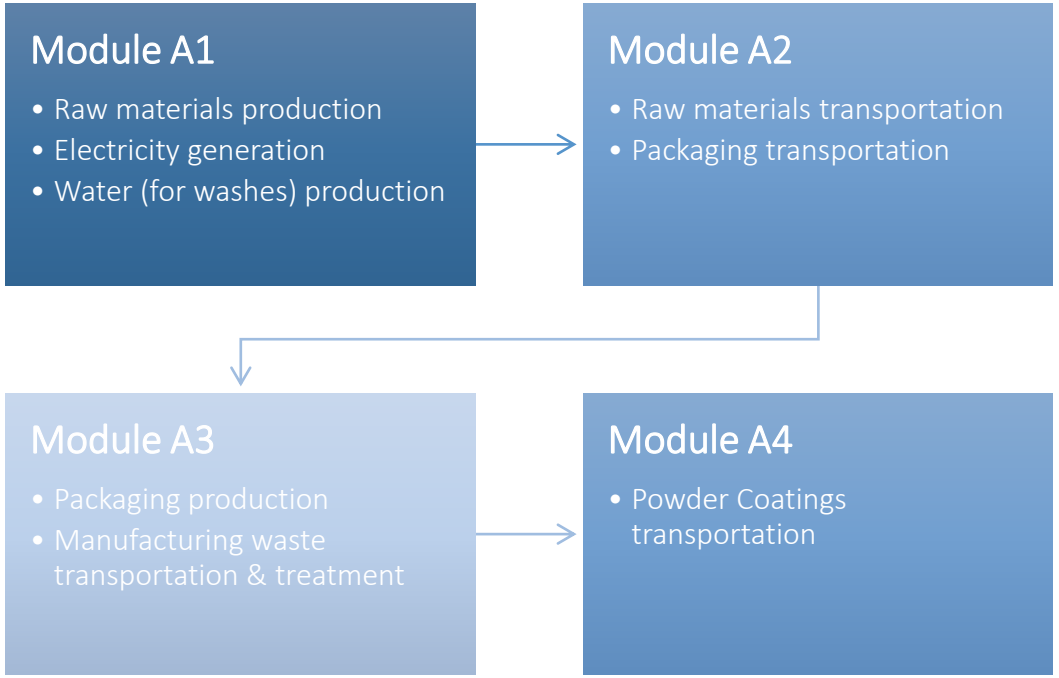
Module A2 includes the transport of all raw materials and utilities to the company's plants.

A3: Manufacturing

Module A3 depicts the environmental impact potentials attributed to all processes taking place at the plant.

A4: Finished Products Transport

Module A4 includes the transport of finished products (PP652 Powder Coatings) to clients/ Building sites. Actual data of distances of sites locations have been taken into account.



Life Cycle Assessment Information

Cut-off criteria

All major raw materials, elements and all the essential energy required are included within the system boundaries. Data for elementary flows to and from the product system contributing to minimum of 99% of the declared environmental impacts are included in the study. Thus, it is assumed that the total neglected input flows are less than 1% of total energy and mass. The only flows that have been excluded from the examined system are:

- IML label is one of the packaging materials used, but it is omitted since this specific quantity is negligible and cannot be measured precisely.
- Internal transportation of raw materials (loading, unloading etc.). The fuel consumption attributed to internal transportation is assumed to be negligible in relation to the transportation from suppliers' facilities, and thus it is omitted.
- Certain packaging waste streams from the manufacturing procedure such as wooden, plastic and carton packaging waste are excluded from the system boundaries since they are traced in minor quantities in comparison to the total manufacturing waste produced.

Assumptions, Allocation and Limitations

- Regarding the exclusion of product life cycle stages and processes, use and end-of-life Life Cycle stages have not been accounted for. Also, construction installation (A5) phase is not included in the EPD.
- Neokem manufacturing processes yield no commercial by-products in its plants. Thus, there is no need for by-product allocation in the manufacturing process..
- A default mean of road transportation "Truck Euro 6 – 9.3t payload – 12 – 14t gross weight" was assumed. Weighted average of the distance covered, and time needed were taken into account. Regarding ship transportation, "Average ship, 3,500t payload capacity" was assumed due to lack of actual data.
- Pigments used in the manufacturing procedure of PP652 Powder Coatings consist of three respective materials. It is assumed that carbon black pigment was exclusively used.
- It is assumed that powder waste is collected and transferred with truck to the landfill point that is 50 km far from the plant.
- Regarding Module A4, the following information is provided:

A4 Scenario Information	Unit
Fuel type and consumption of vehicle or vehicle type used for transport	Euro VI heavy-duty diesel engine truck
Distance	Distance for truck transportations: •Sofia: 790 km •Zagreb: 1,475 km •Bucharest: 1,174 km •Russia: 3,293 km •Greece: 455 km •Attica: 74 km

Background data and data quality

For all processes, primary data were collected and provided by **Neokem**. Data related to material and energy flows of the defined system, were acquired from the company developing the EPD and data related to life cycle impacts resulted from calculations based on widely used and trust-worthy databases.
Primary data refer to January – December 2021 reference period.
In regard to electricity consumption in the manufacturing processes, Guarantees of Origin (GOs) acquired assure that electricity was generated from renewable sources.
The LCA software GaBi ts version 10.6.0.110 was used for inventory and impact assessment calculations based on data entry of the developed mode. A compilation of Ecoinvent v.3.8.1 and Professional 2021 databases was used.

Comparability

- EPDs within the same product category but from different programs may not be comparable.
- EPDs of construction products may not be comparable if they do not comply with EN 15804.
- This EPD and PCR 2019:14 "Construction products" v.1.2.5 are available on the website of The International EPD® System (www.environdec.com).

Environmental Performance Indicators

Core Environmental Impact Categories		Impact/ 1 kg of PP652 (12-30% TiO2) Powder Coating				
	Unit	A1	A2	A3	A1-A3	A4
						
Global Warming Potential -total	kg CO2 eq.	3.679	0.701	-0.022	**4.359**	0.178
Global Warming Potential – fossil	kg CO2 eq.	3.628	0.696	0.023	**4.348**	0.177
Global Warming Potential– biogenic	kg CO2 eq.	0.034	-7.822E-04	-0.045	**-0.011**	-2.272E-04
Global Warming Potential– land use and land use transformation	kg CO2 eq.	0.016	5.752E-03	6.863E-05	**0.021**	1.454E-03
Global Warming Potential– GHG (1)	kg CO2 eq.	3.644	0.702	0.023	**4.369**	0.179
Ozone Depletion Potential	kg CFC-11 eq.	2.933E-09	1.666E-13	3.245E-15	**2.933E-09**	2.268E-17
Acidification Potential	Mole of H+ eq.	0.013	6.478E-03	1.116E-04	**0.020**	1.707E-04
Eutrophication aquatic freshwater	kg P eq.	9.002E-04	2.098E-06	2.560E-06	**9.049E-04**	5.269E-07
Eutrophication aquatic marine	kg N eq.	2.753E-03	3.255E-03	3.668E-05	**6.045E-03**	5.407E-05
Eutrophication terrestrial	mol N eq.	0.027	0.036	3.866E-04	**0.063**	6.408E-04
Photochemical Ozone Formation	kg NMVOC eq.	0.011	9.481E-03	1.156E-04	**0.020**	1.487E-04
Depletion of abiotic resources, minerals and metals (2), (3)	kg Sb eq.	2.904E-06	5.336E-08	1.137E-08	**2.968E-06**	1.351E-08
Depletion of abiotic resources, fossils (2), (3)	MJ net calorific value	73.995	9.348	0.515	**83.857**	2.363
Water Use (2)	m3 world eq. deprived	1.444	5.359E-03	0.012	**1.461**	1.541E-03

(1) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013).

(2) The results of the specific environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

(3) The abiotic depletion potential is calculated and declared in two different indicators:
— ADP-minerals & metals include all non-renewable, abiotic material resources
— ADP-fossil includes all fossil resources and includes uranium.

Environmental Performance Indicators

Use of Resources		Impact/ 1 kg of PP652 (12-30% TiO2) Powder Coating				
	Unit	A1	A2	A3	A1-A3	A4
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ. net calorific value	8.915	0.527	0.566	**10.008**	0.132
Use of renewable primary energy resources used as raw materials	MJ. net calorific value	0.000	0.000	0.000	**0.000**	0.000
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ. net calorific value	8.915	0.527	0.566	**10.008**	0.132
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ. net calorific value	74.017	9.363	0.515	**83.894**	2.366
Use of non-renewable primary energy resources used as raw materials	MJ. net calorific value	0.000	0.000	1.000E-04	**1.000E-04**	0.000
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ. net calorific value	74.017	9.363	0.515	**83.894**	2.366
Use of secondary material	kg	0.000	0.000	0.000	**0.000**	0.000
Use of renewable secondary fuels	MJ. net calorific value	0.000	0.000	0.000	**0.000**	0.000
Use of non-renewable secondary fuels	MJ. net calorific value	0.000	0.000	0.000	**0.000**	0.000
Use of net fresh water	m3	0.039	5.991E-04	3.384E-04	**0.040**	1.509E-04

Environmental Performance Indicators

Waste Categories		Impact/ 1 kg of PP652 (12-30% TiO2) Powder Coating				
	Unit	A1	A2	A3	A1-A3	A4
Hazardous waste disposed	kg	5.190E-05	-6.105E-10	9.090E-11	**5.190E-05**	1.192E-10
Non-hazardous waste disposed	kg	0.021	1.398E-03	0.020	**0.043**	3.515E-04
Radioactive waste disposed	kg	3.387E-04	1.126E-05	4.675E-06	**3.546E-04**	2.862E-06

Output Flows		Impact/ 1 kg of PP652 (12-30% TiO2) Powder Coating				
	Unit	A1	A2	A3	A1-A3	A4
Components for re-use	kg	0.000	0.000	0.000	**0.000**	0.000
Material for recycling	kg	0.000	0.000	0.000	**0.000**	0.000
Materials for energy recovery	kg	0.000	0.000	0.000	**0.000**	0.000
Exported energy, electricity	MJ	0.000	0.000	0.000	**0.000**	0.000
Exported energy, thermal	MJ	0.000	0.000	0.000	**0.000**	0.000

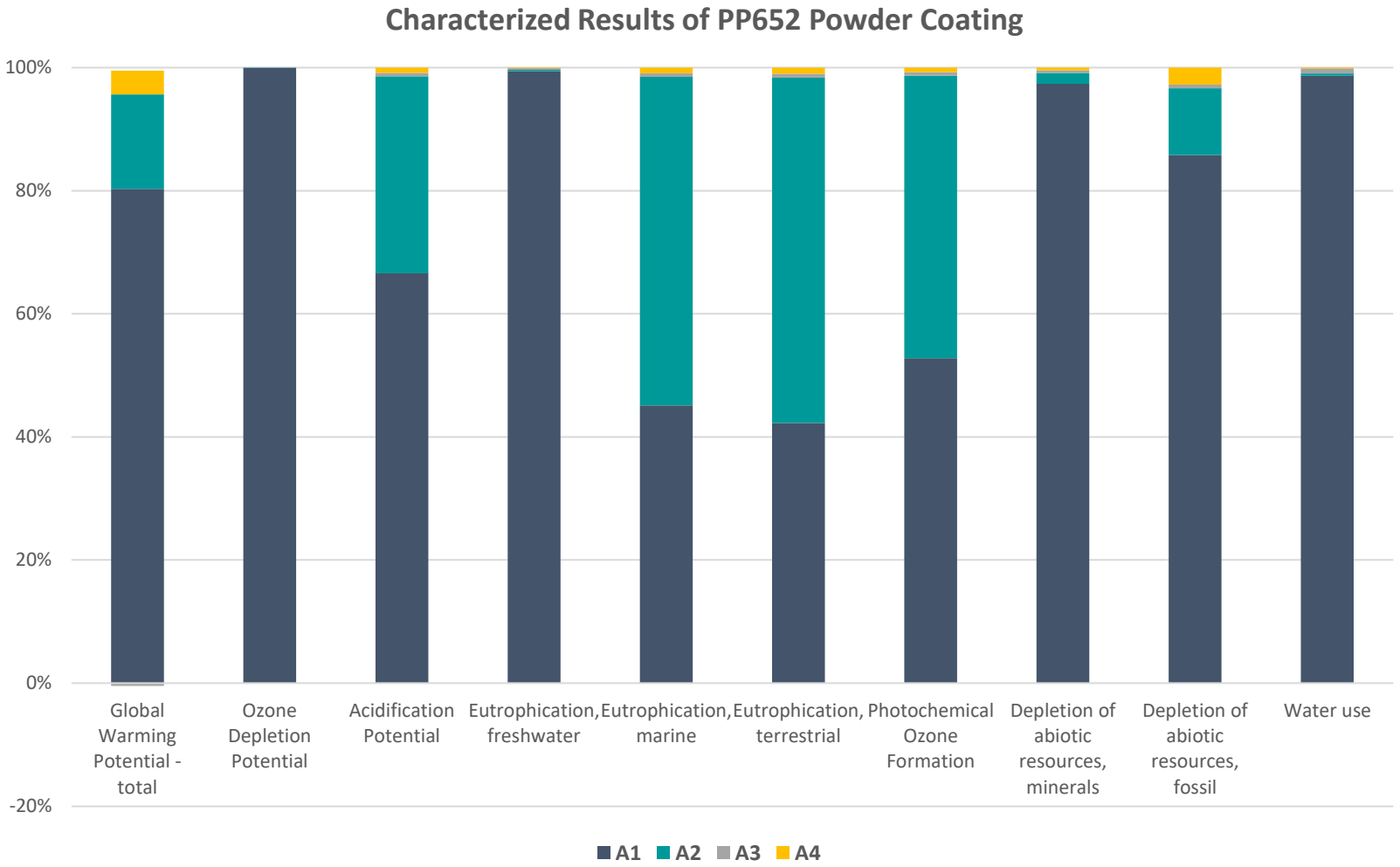
Environmental Performance Indicators

Additional Impact Categories		Impact/ 1 kg of PP652 (12-30% TiO2) Powder Coating				
	Unit	A1	A2	A3	A1-A3	A4
Particulate matter emissions (PM)	Disease incidence	1.112E-07	2.047E-07	1.873E-09	**3.178E-07**	8.594E-10
Ionizing radiation, human health (IRP) (4)	kBq U235 eq.	0.297	1.649E-03	1.507E-03	**0.300**	4.097E-04
Ecotoxicity, freshwater (ETP-fw)	CTU_e	84.947	6.762	0.223	**91.933**	1.707
Human toxicity, cancer effects (HTP-c) (2)	CTU_h	3.336E-09	1.357E-10	4.998E-10	**3.972E-09**	3.446E-11
Human toxicity, non-cancer effects (HTP-nc) (2)	CTU_h	1.556E-07	9.334E-09	3.131E-10	**1.652E-07**	1.782E-09
Land use related impacts/ soil quality (SQP) (2)	Dimensionless	25.583	3.205	3.150	**31.939**	0.811

(4) This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Interpretation

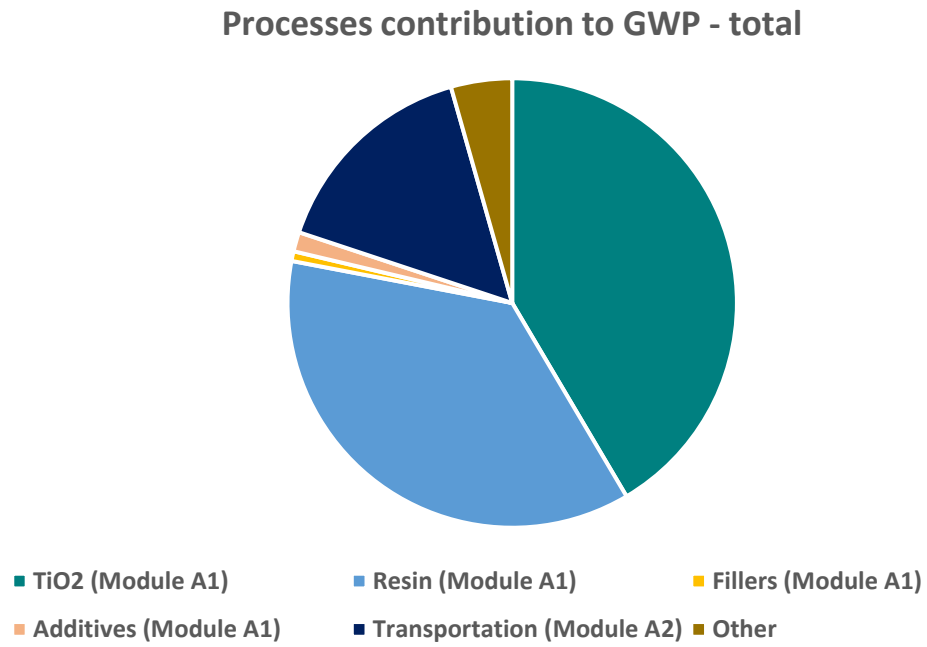
The following figure represents the contribution of each examined modules (A1-A3 & A4) on the core environmental impact indicators formation. Interpretation of the results was carried out in the form of a dominance analysis on the core environmental impacts. It can be clearly depicted that the majority of the analyzed impact categories are mainly influenced by modules A1 & A2.



Also, Module A1 impacts are accounted for at least 70% for most of the core environmental impact indicators. The only environmental impact indicators that are not dominantly affected by Module A1 are Eutrophication, marine, Eutrophication, terrestrial, and Photochemical Ozone Formation, which are equally formed by Module A1 and A2.

Interpretation

Regarding Global Warming Potential – total, Module A1 is the dominant phase of the life cycle (81.08%) followed by Module A2. The greatest proportion of the GWP – total is attributed to the extraction and production of raw materials, and specially to the titanium dioxide and resin production which accounts for 41.5% and 36.5% of the total emissions, respectively. In contrast, electricity consumption holds a negligible proportion (<1%) of the Global Warming Potential – total indicator due to the exclusive use of renewable electricity through the acquired Guarantees of Origin (GOs). A proportion of 15.5% applies for raw materials and packaging transportation.



Neokem is dedicated to monitor and assess the significance of any changes that could affect the environmental impacts results.

Parameters that are taken into consideration are listed as follows:
- Product formulation
- Raw materials supply – transportation distances
- Distribution of finished products

Assumptions or limitations made do not affect the formation of the environmental impacts due to their marginal contribution towards them.

Differences versus previous versions

General changes: Correction of the product's trade name.

References

- International EPD® System, General Program Instructions for the International EPD System, version 4.0
- International EPD® System, PCR 2019:14 Construction products (EN 15804:A2) v. 1.2.5, dated 2022-11-01
- International Organization for Standardization (ISO), Environmental labels and declarations – Type III environmental declarations – Principles and procedures. ISO 14025:2006
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006
- International Organization for Standardization (ISO), Environmental management – Life Cycle assessment – Requirements and guidelines. ISO 14044:2006
- The International EPD® System – The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025. www.environdec.com
- EN ISO 14001 – Environmental Management Systems – Requirements
- ISO 14020 – Environmental Labels and Declarations – General Principles
- Sphera – GaBi Product Sustainability software – www.sphera.com

Factory – Head Offices

95, Ag. Georgiou Str., GR 194 41 Koropi Attiki, Greece P.O. BOX 143
Tel.: (+30) 210 6626860
info@neokem.gr
www.neokem.gr