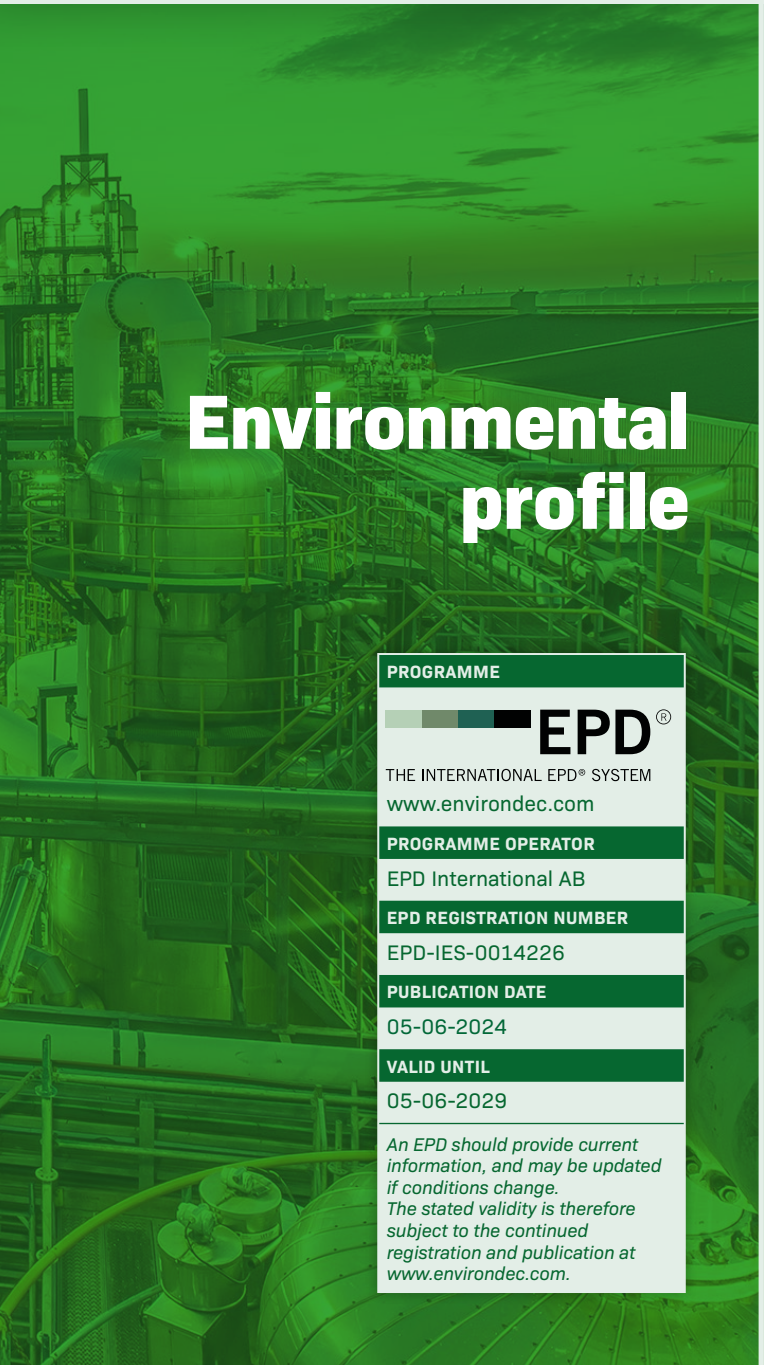
Environmental Product Declaration

NOBIAN



Environmental profile

PROGRAMME

EPD®

THE INTERNATIONAL EPD® SYSTEM

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PROGRAMME OPERATOR

EPD International AB

EPD REGISTRATION NUMBER

EPD-IES-0014226

PUBLICATION DATE

05-06-2024

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05-06-2029

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.

Caustic Soda Microprills

ISCC+ certified

IN ACCORDANCE WITH

ISO 14025 & 14040/44

NOBIAN

Environmental Product Declaration

In accordance with ISO 14025:2006 for:

Caustic soda microprills ISCC+ certified

PROGRAMME INFORMATION

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EPD®

THE INTERNATIONAL EPD® SYSTEM

ACCOUNTABILITIES FOR PCR, LCA AND INDEPENDENT, THIRD-PARTY VERIFICATION

PRODUCT CATEGORY RULES (PCR)

PCR:
Basic Chemicals, 2021:03, Version 1.1.1
UN CPC code(s): Group 342 (basic inorganic chemicals)

PCR review was conducted by:
The Technical Committee of the International EPD® System.
A full list of members available on www.environdec.com.
The review panel may be contacted via info@environdec.com.
Chair of the PCR review: Nasser Ayoub

LIFE CYCLE ASSESSMENT (LCA)

LCA accountability:
Nobian Industrial Chemicals B.V.

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable.

LCA PRACTITIONER

Ecomatters B.V.: Jur Remeijn, Mieke de Jager, Max Sonnen
Weg der Verenigde Naties 1, 3527 KT Utrecht, The Netherlands

THIRD-PARTY VERIFICATION

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier

Third-party verifier: David Althoff Palm. Dalemarken AB

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity incolves third-party verifier:

☐ Yes ☒ No

Company information

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Van Asch van Wijckstraat 53
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NOBIAN

A European leader in essential Chemistry

Nobian is a European market leader in the production of salt, essential chemicals and energy for industries, ranging from construction and cleaning to pharmaceuticals and water treatment. We excel in the safe and reliable supply of high-purity salt, chlor-alkali, chloromethane and hydrogen, thanks to our integrated value chain with modern production sites in the Netherlands, Germany and Denmark.

We have a strong history in salt production dating back more than 100 years to 1918, and we have in-depth experience in underground energy storage. Our 1,600 employees are committed to becoming safer, more efficient and more sustainable. This is how we ensure that today's essential products continue to improve our lives in the future through chemistry on which you can rely.

Grow Greener Together

At Nobian sustainability is in our hearts and actions. It is our ambition to become one of the most sustainable chemical companies in Europe. We have set ourselves aspirational climate targets which are ahead of the Paris Agreement goals – such as becoming carbon neutral by 2040, with 100% renewable energy.

We work at the heart of the energy transition and we help our customers reduce their carbon footprint with our green products, that will have a positive impact on our world, and engage meaningfully with our people, stakeholders and communities.

We will achieve this through our comprehensive sustainability program: Grow Greener Together. Through this program we focus on the areas where we can have the biggest impact, centered around three pillars: Climate, Circular, and Care:

Climate	Circular	Care
CO_2 reduction	Green Products	Health & Safety
Renewable Energy	Water	Community
Energy Efficiency and Storage	Recycling	People

Each pillar consists of three focus areas, each of which has tangible key performance indicators (KPIs) and targets.

We have aligned our pillars with the UN Sustainable Development Goals based on where we can make the biggest impact.

Product information

Caustic soda microprills

ISCC+ certified

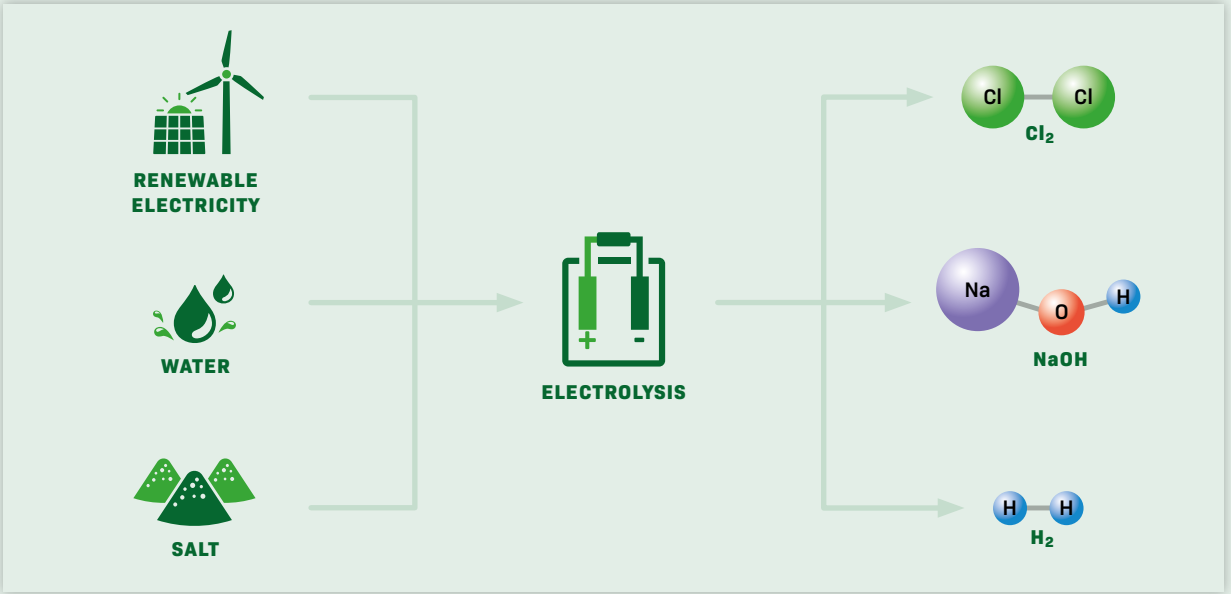
PRODUCT IDENTIFICATION:
CAS 1310-73-2

Caustic soda microprills are the solid form of sodium hydroxide (NaOH). The microprills are small fused pearls, which are color- and odorless and very hygroscopic.

The microprills are obtained from a caustic soda solution by the evaporation of water. The caustic soda solution is produced by an energy intensive electrolysis process from salt and water. Simultaneously, chlorine and hydrogen are formed.

Based on (local) availability, Nobian uses various sources of energy in its production processes. Our ISCC+ certified caustic soda microprills are produced from ISCC+ caustic soda lye, which is produced with 100% renewable energy in the electrolysis step, resulting in a significantly lower product carbon footprint compared to caustic soda lye produced with fossil energy.

International Sustainability and Carbon Certification (ISCC) is a certification system that offers solutions for the implementation and certification of sustainable and traceable supply chains. ISCC+ is a certification system for all markets and sectors not regulated by the Renewable Energy Directive II. More information about ISCC and ISCC+ can be found on www.iscc-system.org.



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LCA Information

Declared unit

The environmental impacts have been calculated with the declared unit of 1 kg caustic soda (NaOH 100%) ISCC+ certified microprills.

Scope of LCA

This study has been prepared under the ISO14025 standard for environmental product declarations. The life cycle assessment (LCA) calculations themselves have been prepared in alignment with ISO14040/14044 and the Product Category Rules (PCR) of Basic Chemicals (PCR2021:03, v1.1). The LCA is a cradle-to-gate calculation (including upstream and core activities) with downstream transport to customers. The presented life cycle stages correspond to module A1 (upstream activities), A2-A3 (core activities) and A4 (downstream transport to customers) of the EN15804+A2 standard. The LCA was prepared for the caustic soda microprills production site in Frankfurt (Germany), which is presented in this environmental profile.

Upstream activities (A1)

Upstream activities include the extraction and production of raw materials. The bill of materials of 2021 was used as input data. Background processes from the Ecoinvent 3.8 database and Sphera datasets were used for input materials.

Core activities (A2+A3)

Transport of raw materials to the production site was included, based on the distance to the supplier location.

Furthermore, the production process of caustic soda microprills has been modelled with all inputs and outputs to the process, including auxiliary processes such as maintenance and storage where applicable.

Production data of 2021 were used with the electricity mix based on Q1 of 2024. Caustic soda microprills are produced by evaporating 50% caustic soda lye, also produced by Nobian. ISCC+ microprills are produced with ISCC+ caustic soda 50% lye from the Frankfurt site.

Waste generated in the process has been modelled according to type (hazardous or non-hazardous) and destination (e.g. landfill or incineration). Most of the waste was non-hazardous waste being recycled or disposed. A small fraction of the waste was classified as hazardous waste. Transport of the waste to a waste plant was included, assuming an average distance of 80 km.

Downstream activities (A4)

Transport of caustic soda microprills to customers was included in the downstream module. Average transport distances and modes were calculated by the transportation department of Nobian.

The end-of-life treatment of packaging waste was also included, based on estimations made by Nobian.

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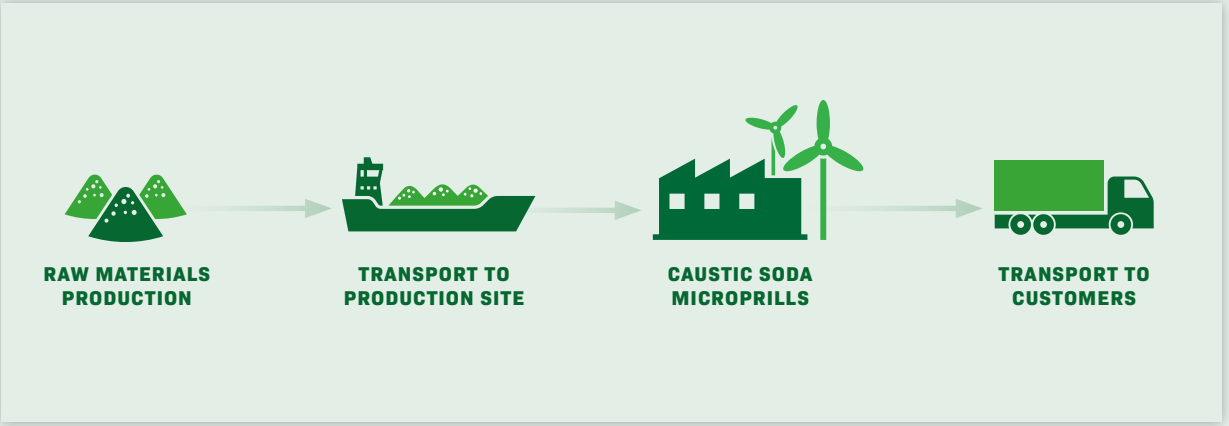
LCA Information



Life cycle stages of caustic soda microprills production in the LCA.

Excluded life cycle stages

The use stage was excluded due to the wide variety of applications where caustic soda 100% microprills are used. The end-of-life stage is excluded as the following criteria are fulfilled:

- the product is physically integrated with other products in subsequent life cycle process so they cannot be physically separated from them at end of life,
- the product or material is no longer identifiable at end-of-life as a result of a physical or chemical transformation process,
- the product or material does not contain biogenic carbon, and
- the EPD shall not be used for business-to-consumer communication.

Declaration of SVHC

None of the substances contained in the product are listed in the 'Candidate list of Substances of Very High Concern for authorization' or they do not exceed the threshold of the European Chemicals Agency.

Data and software

Primary data for caustic soda microprills production was collected from Nobian process experts through data questionnaires and contained data for the year 2021 as well as electricity data for Q1 2024. If no supplier data on the environmental impact was available, background data from the Ecoinvent 3.8 database was used. If no suitable datasets were available in Ecoinvent, Sphera datasets were used. The LCA was modelled in Gabi software version 10.7.0.183.

Cut-off criteria for inputs and outputs

All inputs and outputs to the process of caustic soda microprills production have been included. For a few input materials, proxy datasets have been used, although these only contributed to the minority of the environmental impact. Auxiliary activities, such as maintenance and storage have been included where relevant. In total, >99% of all inputs and outputs have been modelled.

Allocation procedures

Caustic soda is produced by an electrolysis process, which simultaneously produces chlorine and hydrogen. The environmental impact has been allocated between the three products using a mixed allocation. Allocation to hydrogen was done by economic allocation (based on a 3-year average), and mass allocation was applied to the remaining impacts for chlorine and caustic soda. This is in line with the different standards and industry requirements. The subsequent evaporation steps to 100% caustic soda are fully allocated to the caustic soda microprills.

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Product carbon footprint

The main result is the Global Warming Potential (GWP) which represents the CO_2-eq emissions (Table 1). Greenhouse gas (GHG) emissions have been converted into CO_2-eq according to the PCR for Basic chemicals, which follows the EN15804+A2 and IPCC2021 conversion factors of GHGs into CO_2-eq emissions.

Since fossil CO_2-eq is the main driver for climate change, we follow the industry standard and focus on our carbon footprint excluding biogenic CO_2-eq emissions.

The cradle-to-gate carbon footprint (excluding biogenic CO_2-eq) of ISCC+ certified caustic soda microprills is 3.04E-01 kg CO_2-eq / kg NaOH (100%).

The full carbon footprint, including biogenic CO_2-eq emissions, downstream transport and downstream waste treatment of packaging materials, is provided below in Table 1.

Table 1 | Global warming potential per kg of caustic soda microprills (100% NaOH)

Parameter	Upstream kg CO_2-eq	Core kg CO_2-eq	Cradle to gate (upstream + core) kg CO_2-eq	Downstream transport to customers kg CO_2-eq	Total kg CO_2-eq
GWP – fossil	5.50E-02	2.48E-01	3.03E-01	8.74E-02	3.91E-01
GWP – land use and land use change (LULUC)	5.66E-05	5.71E-04	6.28E-04	3.34E-05	6.61E-04
GWP – total (excl. biogenic)	**5.51E-02**	**2.49E-01**	**3.04E-01**	**8.75E-02**	**3.91E-01**
GWP – biogenic	-3.43E-02	3.14E-03	-3.12E-02	4.87E-02	1.76E-02
GWP – total (incl. biogenic)	2.07E-02	2.52E-01	2.73E-01	1.36E-01	4.09E-01

Core emissions are the main contributor to the microprills environmental impact, which is mostly derived from energy use (electricity & heat). The upstream impact is largely associated with the production of salt for electrolysis.

Environmental performance

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In the LCA, other impact categories are included as well, which are listed in table 2a and 2b. All values are calculated according to the PCR, which follows the EN15804+A2 impact calculation methodology.

The main contributor to the environmental impact is emissions in the core process, for 14 out of 15 environmental categories. For one category, the upstream impact is highest because of the impacts of the production of raw materials (primarily salt and wooden pallet production).

Table 2a | Environmental impact per kg of caustic soda microprills (100% NaOH) core indicators

Parameter	Unit of measure	Upstream	Core	Cradle to gate (upstream + core)	Downstream transport to customers	Total
AP	mol H^+-eq	2.88E-04	2.61E-03	2.90E-03	4.20E-04	3.32E-03
EP – fresh water	kg P-eq	1.33E-05	7.72E-05	9.05E-05	5.41E-06	9.59E-05
EP – marine	kg N-eq	1.01E-04	7.85E-04	8.85E-04	1.45E-04	1.03E-03
EP – terrestrial	mol N-eq	8.44E-04	1.14E-02	1.23E-02	1.58E-03	1.38E-02
POCP	kg NMVOC-eq	2.04E-04	2.26E-03	2.46E-03	4.51E-04	2.91E-03
ODP	kg CFC11-eq	5.78E-09	3.32E-08	3.90E-08	1.93E-08	5.83E-08
ADP – minerals and metals*	kg Sb-eq	4.98E-07	2.42E-06	2.91E-06	2.90E-07	3.20E-06
ADP - fossil*	MJ	9.21E-01	4.02E+00	4.94E+00	1.26E+00	6.21E+00
WDP*	m^3 world eq deprived	4.18E-01	4.55E-02	4.63E-01	6.00E-03	4.69E-01

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 photochemical oxidants
ODP = Depletion potential of the stratospheric ozone layer
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*

* *The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.*

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Environmental performance

Table 2b | Environmental impact per kg of caustic soda microprills (100% NaOH) additional indicators

Parameter	Unit of measure	Upstream	Core	Cradle to gate (upstream + core)	Downstream transport to customers	Total
PM	Disease incidence	3.05E-09	2.67E-08	2.97E-08	5.97E-09	3.57E-08
IRP*	kBq U235 eq	2.63E-03	2.57E-02	2.84E-02	6.47E-03	3.48E-02
ETP-fw**	CTUe	5.29E-01	9.47E-01	1.48E+00	1.02E+00	2.49E+00
HTP-c**	CTUh	1.04E-10	2.94E-10	3.97E-10	3.24E-11	4.30E-10
HTP-nc**	CTUh	5.19E-10	7.37E-09	7.89E-09	9.43E-10	8.83E-09
SQP	–	5.19E+00	3.90E+01	4.41E+01	8.65E-01	4.50E+01

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235*
ETP-fw = Potential Comparative Toxic Unit for ecosystems**
HTP-c = Potential Comparative Toxic Unit for humans**
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer**
SQP = Potential soil quality index

* *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.*

** *The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.*

Use of resources

Resource use for the caustic soda microprills production is reported in table 3. Resource use is primarily associated with core process (energy-related) and upstream processes (material and water-related). No use of secondary materials or fuels is reported.

Table 3 | Use of energy resources per kg of caustic soda microprills (100% NaOH)

Parameter		Unit	Upstream	Core	Cradle to gate (upstream + core)	Downstream transport to customers	Total
Primary energy resources – renewable	Use as energy carrier	MJ, net calorific value	7.68E-01	9.96E+00	1.07E+01	1.78E-02	1.07E+01
	Used as raw material	MJ, net calorific value	4.66E-04	1.53E-07	4.66E-04	1.01E-08	4.66E-04
	Total	MJ, net calorific value	7.69E-01	9.96E+00	1.07E+01	1.78E-02	1.07E+01
Primary energy resources – non-renewable	Use as energy carrier	MJ, net calorific value	9.21E-01	4.02E+00	4.94E+00	1.26E+00	6.21E+00
	Used as raw material	MJ, net calorific value	6.30E-07	1.24E-08	6.43E-07	0.00	6.43E-07
	Total	MJ, net calorific value	9.22E-01	4.02E+00	4.94E+00	1.26E+00	6.21E+00
Secondary material		kg	0.00	0.00	0.00	0.00	0.00
Renewable secondary fuel		MJ, net calorific value	0.00	0.00	0.00	0.00	0.00
Non-renewable secondary fuel		MJ, net calorific value	0.00	0.00	0.00	0.00	0.00
Net use of fresh water		m^3	1.51E-02	1.17E-03	1.63E-02	1.40E-04	1.64E-02

Waste production and output flows

Waste and other output indicators are shown in table 4 and 5. Waste is reported for core processes only. No radioactive waste, component re-use or exported energy is reported. Materials for energy recovery are also reported as zero, because no end-of-waste status is achieved for waste going to incineration with energy recovery.

Table 4 | Waste production per kg of caustic soda microprills (100% NaOH)

Parameter	Unit	Upstream	Core	Cradle to gate (upstream + core)	Downstream transport to customers	Total
Hazardous waste disposed	kg	0.00	4.69E-05	4.69E-05	0.00	4.69E-05
Non-hazardous waste disposed	kg	0.00	0.00	0.00	0.00	0.00
Radioactive waste disposed	kg	0.00	0.00	0.00	0.00	0.00

Table 5 | Output flows per kg of caustic soda microprills (100% NaOH)

Parameter	Unit	Upstream	Core	Cradle to gate (upstream + core)	Downstream transport to customers	Total
Components for reuse	kg	0.00	0.00	0.00	0.00	0.00
Material for recycling	kg	0.00	1.04E-04	1.04E-04	0.00	1.04E-04
Materials for energy recovery*	kg	0.00	0.00	0.00	0.00	0.00
Exported energy – electricity	MJ	0.00	0.00	0.00	0.00	0.00
Exported energy – thermal	MJ	0.00	0.00	0.00	0.00	0.00

* *The parameter 'Materials for energy recovery' does not include materials for waste incineration with energy recovery, unless all criteria for end-of-waste state have been fulfilled prior to the incineration.*

Biogenic carbon content

The biogenic carbon content for products and packaging is shown in table 6. No biogenic carbon content is reported for caustic soda microprills. The biogenic carbon content in microprills packaging, associated with wooden pallets and cardboard packaging, is indicated in the table below.

Table 6 | Biogenic carbon content per kg of caustic soda microprills (100% NaOH)

Parameter	Unit	Upstream	Core	Cradle to gate (upstream + core)	Downstream transport to customers	Total
BCCpr	kg C	0.00	0.00	0.00	0.00	0.00
BCCpa	kg C	-1.10E-02	0.00	-1.10E-02	1.10E-02	0.00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

References

- CEN (2019), EN 15804:2012+A2:2019 – Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
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- ISO 14025:2016 – Environmental labels and declarations.
- ISO 14040:2006 – Environmental management – Life cycle assessment – Principles and framework.
- ISO 14044:2006 – Environmental management – Life cycle assessment – Requirements and guidelines.
- Product Category Rules – Basic Chemicals version 1.1, 2021.
- Sphera GaBi Software-System and Database for Life Cycle Engineering. Copyright 1992-2018 Sphera.
- Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. The Ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, [online] 21(9), pp.1218–1230. Available at: http://link.springer.com/10.1007/s11367-016-1087-8 [Accessed 17-02-2023]

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June 2024