

**Declaration Owner**

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Product Line

Avonite Surfaces® Solid Surface

Functional Unit

The functional unit is one square meter of countertop provided and maintained for a period of 10 years in residential use.

EPD Number and Period of Validity

SCS-EPD-05006
EPD Valid June 8, 2018 through June 7, 2023

Product Category Rule

Product Category Rule for Environmental Product Declarations:
PCR for Residential Countertops. NSF International. Valid through
September 17, 2018.

Program Operator

SCS Global Services
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Table of Contents

Product Scope.....cover

About Aristech Surfaces LLC..... 2

Product Description..... 2

Product Characteristics and Performance 2

Material Composition 4

Life Cycle Assessment Stages 4

Product Life Cycle Flow Diagram 5

Life Cycle Inventory 6

Life Cycle Impact Assessment 7

Additional Environmental Information 8

Supporting Technical Information..... 9

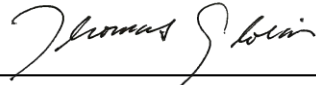
References 12

Disclaimers: This EPD conforms to ISO 14025, 14040, and ISO 14044.

Scope of Results Reported: The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.

Accuracy of Results: Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.

Comparability: The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner’s assumptions, the source of the data used in the study, and the specifics of the product modeled.

PCR review, was conducted by	Evan Griffing, PhD, Environmental Clarity LLC, egriffing@environmentalclarity.com
Approved Date: June 8, 2018 – End Date: June 7, 2023	
Independent verification of the declaration and data, according to ISO 14025:2006	<input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier	 <hr/> Tom Gloria, Ph.D., Industrial Ecology Consultants

ABOUT ARISTECH SURFACES LLC

Aristech Surfaces LLC produces and internationally markets its flagship brands: Avonite Surfaces® solid surface, STUDIO Collection® design resin and Aristech Acrylics® acrylic sheet. Aristech provides first quality, environmentally responsible, high-end aesthetic solutions sought by architects, designers, fabricators, OEMs and building owners around the globe. We continually strive to improve our energy and water efficiency, landfill diversion, and air quality, using performance metrics we measure and report. Recent and ongoing environmental initiatives include conversion to LED lighting at our plants and offices, proactive recycling of office and industrial materials, high-efficiency motor upgrades to machine drives, industrial water filtration and recycling systems and thermal oxidizing units with heat recovery to reduce VOC emissions. Aristech is a member of the U.S. Green Building Council, and the American Chemistry Council's Responsible Care®, pledged to improve and report our progress on the health and safety of our employees, our communities and our environment.

PRODUCT DESCRIPTION

Avonite Surfaces® is a global leading brand of solid surface products for the architecture and design community. Avonite offers a broad palette of colors and designs for commercial and institutional projects. It can be used in vertical or horizontal applications, applied in straight or curved lines, or thermoformed into a myriad of shapes for countertops, wet walls, divider panels, sinks and showers, furniture, interior and exterior architectural features, and many other uses your imagination can conceive. In accordance with the PCR, the product is classified in this EPD as polymeric solid surface countertop. The manufacturer warrants for a period of 10 years from the date of purchase.

Avonite products are available in popular 12 mm thickness, plus 3 mm to 18 mm. Sheets are available in the industry standard 30 in x 144 in and in our exclusive "Right Size™" widths from 24 in to 60 in in custom lengths to minimize waste and scrap, and reduce seaming and installation labor.

PRODUCT CHARACTERISTICS AND PERFORMANCE

Avonite products conform to the following specifications:

- NSF/ANSI 51 – Food equipment materials
- ISFA-2-01 (2013) Classification and standard for solid surfacing material
- ISFA-2-02 (2013) Fabrication standard for solid surfacing material
- ISO 19712-1 Classification and specification of solid surfaces
- ISO 19712-2 Classification and specification of sheets

Table 1. Product characteristics for Avonite Surfaces®.

Characteristic	Nominal Value	Unit
Sheet thickness	12 (0.50)	mm (inch)
Sheet length	3,658 (144)	mm (inch)
Sheet width	762 (30.0)	mm (inch)
Sheet weight	20.86 (4.3)	kg/m ² (lb/ft ²)
VOC Emissions Test Method	Indoor Advantage Gold™	-

Table 2. Product performance test results for Avonite Surfaces®.

Properties	Unit	Results	Test Method
General			
Nominal Thickness	mm	12	-
Density	g/cm ³	1.73	ASTM D-792
Water Absorption (24hrs.)	%	0.04	ASTM D-570
Mechanical			
Tensile Strength	psi	4,500	ASTM D-638
Tensile Modulus	psi	1,525,000	ASTM D-638
Tensile Elongation	%	0.40	ASTM D-638
Flexural Strength	psi	9,300	ASTM D-790
Flexural Modulus	psi	1,260,000	ASTM D-790
Barcol Hardness	-	63	ASTM D-2583
Rockwell Hardness (M Scale)	-	94	ASTM D-785
Charpy Impact	ft-lbs/inch	1.10	ASTM D-6110
Ball impact (1/2 lb. ball, no failure)	inches	>150	NEMA LD3-3.8
Thermal			
DTUL @ 264 psi	°F	215	ASTM D-648
Coefficient of Thermal Expansion	in/in °F	2.09x10 ⁻⁵	ASTM D-696
Boiling Water Resistance	-	No Effect	ISFA 2-01
High Temperature Resistance	-	No Effect	ISFA 2-01
Reaction to Fire	-	Class A	ASTM E-84
Combustion Toxicity	-	98	Pittsburgh Protocol
Total Volatile Organic Compounds	µg/m ² /hr	69.1	ASTM D-5116
Surface			
Consistency of Color (Same Sheet)	-	Passes	ISFA 2-01
Light Resistance	-	No Effect	ISFA 2-01
Cleanability/Stain Resistance	-	Passes	NEMA LD3-3.4
Stain Resistance	-	Passes	ANZI/ICPA SS-1
Bacterial Resistance	-	No Growth	ASTM G-22
Fungi Resistance	-	No Growth	ASTM G-21
Food Zone Use	-	Approved	NSF 51

MATERIAL COMPOSITION

Table 3. Material composition of Avonite Surfaces® in kilograms per functional unit and in percentage of total weight.

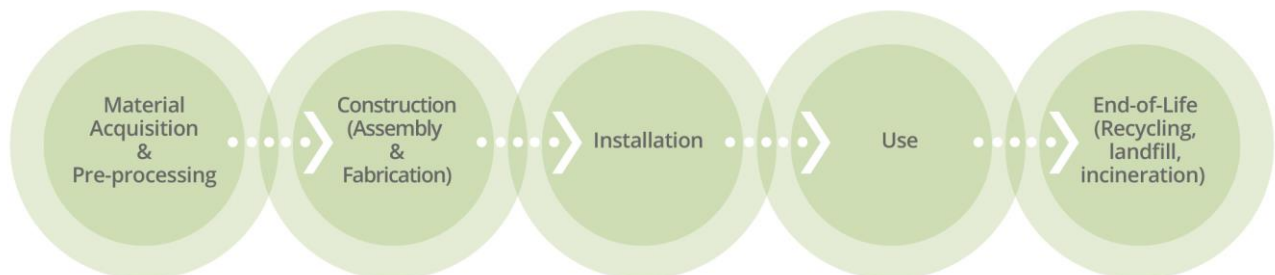
Material	Amount in Final Product (kg/m ²)	Percent of Total (%)	Material Resources Type
Product			
Alumina trihydrate	13.5	64.6%	Virgin non-renewable
Acrylic resin	7.15	34.2%	Virgin non-renewable
Other ingredients	0.225	1.08%	Virgin non-renewable
Total	20.8	100%	-
Packaging			
Wood pallet	1.81	98.5%	Virgin renewable
Protective film (LDPE)	0.028	1.51%	Virgin non-renewable
Total	1.84	100%	-



Private Façade, Architect: Laurence Sonck, Fabrication: M2 IBIZA CONSTRUCT SL, Photo: Arsen Mikitov, www.islacinema.com

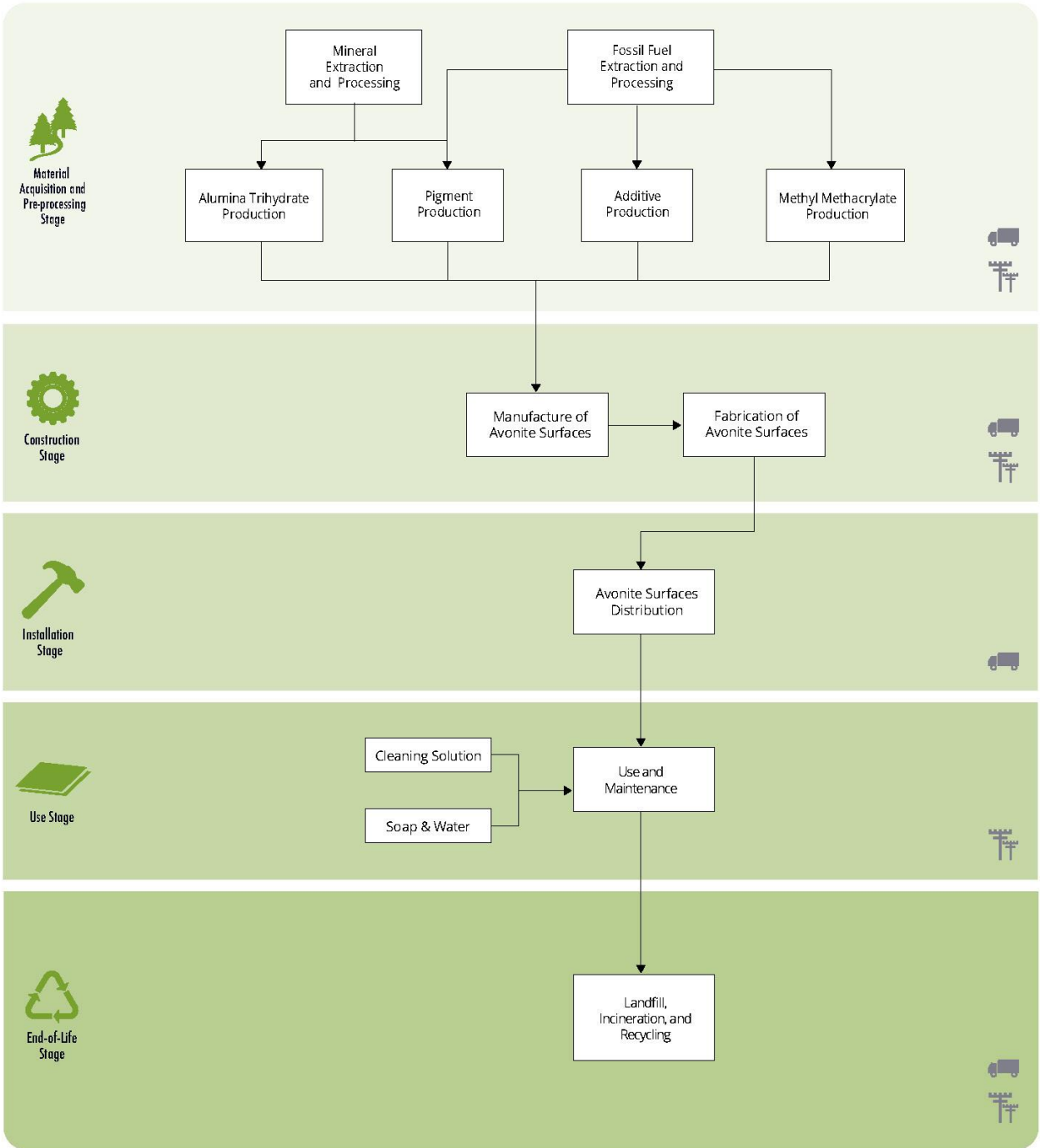
LIFE CYCLE ASSESSMENT STAGES

A cradle-to-grave life cycle assessment (LCA) was completed for this product in accordance with ISO 14040, ISO 14044, and the Product Category Rule for Environmental Product Declarations: *PCR for Residential Countertops*. The diagram below illustrates the life cycle stages included in this EPD.



PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the life cycle of Avonite Surfaces®. This includes material acquisition and pre-processing, construction (assembly and fabrication), installation, use, and end-of-life.



LIFE CYCLE INVENTORY

The life cycle inventory (LCI) flows for the EPD are shown in Table 4 in accordance with the requirements of the PCR. Water usage from electricity generation is included. Results are rounded to two significant figures.

Table 4. Life cycle inventory flows for 1 m² Avonite Surfaces® provided and maintained for a period of 10 years.

Parameter	Total	Material Acquisition & Pre-processing	Construction	Installation	Use	End-of-Life
Emissions to Air (kg)						
SO _x	0.31	0.24	5.9x10 ⁻²	5.5x10 ⁻³	7.9x10 ⁻³	1.5x10 ⁻³
NO _x	0.18	5.7x10 ⁻²	9.1x10 ⁻²	1.6x10 ⁻²	1.1x10 ⁻²	6.8x10 ⁻³
CO ₂	87	47	22	3.6	12	1.0
Methane	9.2x10 ⁻²	4.5x10 ⁻²	3.3x10 ⁻²	3.4x10 ⁻³	9.2x10 ⁻³	8.5x10 ⁻⁴
N ₂ O	3.6x10 ⁻³	3.4x10 ⁻⁴	5.5x10 ⁻⁴	7.4x10 ⁻⁵	2.6x10 ⁻³	4.2x10 ⁻⁵
CO	0.15	4.8x10 ⁻²	4.5x10 ⁻²	7.7x10 ⁻³	5.0x10 ⁻²	3.0x10 ⁻³
Water Usage and Emission to Water (kg)						
Water Consumption	2,300	610	640	41	950	11
Phosphates	4.2x10 ⁻²	2.2x10 ⁻²	1.6x10 ⁻²	8.9x10 ⁻⁴	2.9x10 ⁻³	1.3x10 ⁻⁴
Nitrates	0.17	4.0x10 ⁻³	6.5x10 ⁻³	2.8x10 ⁻⁴	0.16	4.2x10 ⁻⁵
Dioxin	0.0	0.0	0.0	0.0	0.0	0.0
Arsenic	3.4x10 ⁻⁴	2.9x10 ⁻⁴	3.6x10 ⁻⁵	3.0x10 ⁻⁶	7.8x10 ⁻⁶	3.3x10 ⁻⁷
Lead	3.3x10 ⁻⁴	2.9x10 ⁻⁵	2.9x10 ⁻⁴	3.0x10 ⁻⁶	8.3x10 ⁻⁶	2.9x10 ⁻⁷
Mercury	3.4x10 ⁻⁶	9.6x10 ⁻⁷	2.1x10 ⁻⁶	6.6x10 ⁻⁸	3.0x10 ⁻⁷	9.9x10 ⁻⁹
Cadmium	2.9x10 ⁻⁵	7.2x10 ⁻⁶	1.6x10 ⁻⁵	1.3x10 ⁻⁶	3.9x10 ⁻⁶	1.4x10 ⁻⁷
Chromium	2.0x10 ⁻³	1.8x10 ⁻³	9.4x10 ⁻⁵	9.9x10 ⁻⁶	2.2x10 ⁻⁵	1.2x10 ⁻⁶
Energy Type and Usages (MJ)						
Primary energy demand	1,600	1,000	440	61	100	18
Fossil fuels	1,400	990	330	59	28	18
Nuclear	46	8.4	34	1.0	2.2	0.14
Renewable*	150	6.7	72	0.72	72	0.16
Waste Management (kg)						
Incineration with energy recovery	INA	INA	INA	INA	INA	INA
Incineration without energy recovery	INA	INA	INA	INA	INA	INA
Landfill (Non-hazardous waste)	2.3	0.61	0.64	4.1x10 ⁻²	0.95	1.1x10 ⁻²
Hazardous waste	5.7x10 ⁻⁴	1.5x10 ⁻⁴	3.3x10 ⁻⁴	3.4x10 ⁻⁵	5.2x10 ⁻⁵	7.2x10 ⁻⁶
Landfill avoidance (recycling)	1.6x10 ⁻²	Negligible	1.6x10 ⁻²	Negligible	Negligible	Negligible

*Solar, wind, hydro, biomass

INA = Indicator not assessed

LIFE CYCLE IMPACT ASSESSMENT

The life cycle impact assessment (LCIA) for the EPD is conducted in accordance with requirements of the PCR. All impact category indicators are estimated using TRACI 2.1, with the exception of abiotic depletion elements (elements and fossil fuels), which are estimated using CML-IA. The LCIA results are calculated using SimaPro 8.3 software. Results are rounded to two significant figures.

Table 5. LCIA results for 1 m² Avonite Surfaces® provided and maintained for a period of 10 years.

Impact Category	Units	Total	Material Acquisition & Pre-processing	Construction	Installation	Use	End-of-Life
Global warming potential	kg CO ₂ eq	86 100%	49 57%	23 27%	3.7 4.3%	10 11%	1.0 1.2%
Acidification potential	kg SO ₂ eq	0.46 100%	0.28 62%	0.13 27%	1.7x10 ⁻² 3.7%	2.7x10 ⁻² 5.9%	6.3x10 ⁻³ 1.4%
Photochemical ozone creation potential	kg O ₃ eq	5.7 100%	2.6 45%	2.3 39%	0.40 7.0%	0.31 5.4%	0.17 2.9%
Eutrophication potential	kg N eq	0.21 100%	0.10 47%	5.2x10 ⁻² 25%	4.1x10 ⁻³ 2.0%	5.3x10 ⁻² 25%	9.8x10 ⁻⁴ 0.46%
Ozone depletion potential	kg CFC-11 eq	1.1x10 ⁻⁵ 100%	5.8x10 ⁻⁶ 52%	3.8x10 ⁻⁶ 34%	9.1x10 ⁻⁷ 8.1%	3.7x10 ⁻⁷ 3.3%	2.8x10 ⁻⁷ 2.5%
Abiotic depletion potential (elements)*	kg Sb eq	1.1x10 ⁻⁴ 100%	4.4x10 ⁻⁵ 39%	3.9x10 ⁻⁵ 36%	1.1x10 ⁻⁵ 10%	1.6x10 ⁻⁵ 14%	7.4x10 ⁻⁷ 0.67%
Abiotic depletion potential (fossil fuels)	MJ	1,400 100%	990 69%	330 23%	59 4.1%	28 1.9%	18 1.2%

* This indicator is based on assumptions regarding current reserves estimates. Users should use caution when interpreting results because there is insufficient information on which indicator is best for assessing the depletion of abiotic resources.



Retail Kiosk - Abdali Mall, Architect: Gensler Architects, Fabricator: Roskopf+Partner AG, Photo: Abdali Mall Company

ADDITIONAL ENVIRONMENTAL INFORMATION



INDOOR ADVANTAGE GOLD
BUILDING MATERIALS

The Avonite Surfaces® product line is certified Indoor Advantage Gold™ by SCS Global Services (SCS-IAQ-04802), which conforms to the CDPH/EHLB Standard Method (CA 01350) v1.2-2017. The measured concentration of total volatile organic compounds (TVOC) less than or equal to 0.5 mg/m³.



MINIMUM 16% RECYCLED CONTENT
PRE-CONSUMER

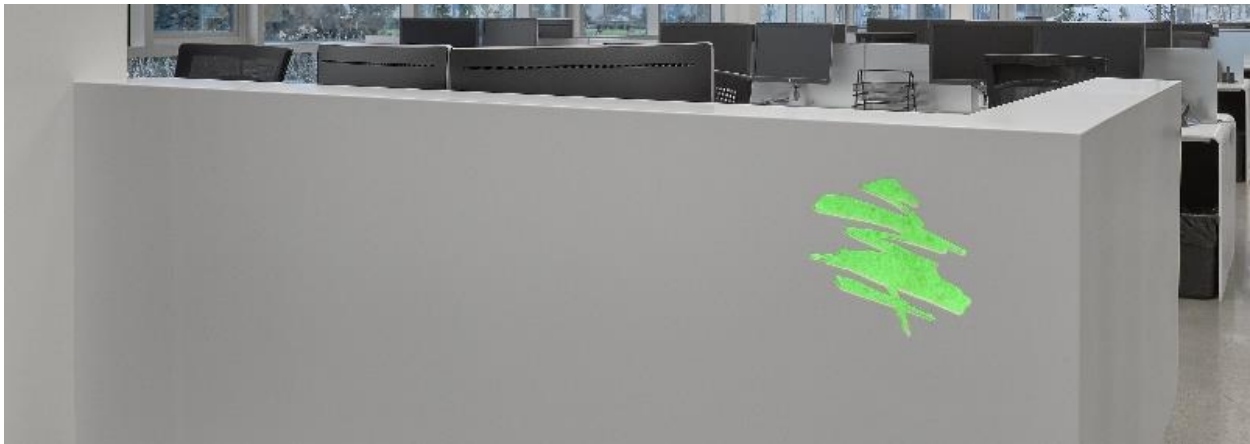
Several Avonite Surfaces® products are certified Recycled Content™ by SCS Global Services (SCS-MC-02224), which conforms to SCS Recycled Content Standard v7-0, for an average minimum 16% pre-consumer recycled polymer content. The material quantification is calculated by a mass-balance on a dry-weight basis.



The Avonite Surfaces® product line is certified NSF/ANSI 51 by NSF International (Certificate #: 02931-02), which establishes the minimum health and sanitation requirements for materials used in the making of commercial food equipment. The product line materials were assessed, for use only as a table or countertop, to not contaminate all food contact types with a maximum temperature of use of 300 °F.

The Avonite Surfaces® product line is represented by a self-declared Health Product Declaration, prepared in accordance to the Health Product Declaration® Open Standard, Version 1.0 (December 15, 2012). The content of the product was assessed for health hazard warning as required using MSDS (1,000 & 10,000 ppm). This product is pending an updated HPD in conformance to the Health Product Declaration® Open Standard, Version 2.1 (May 1, 2017). The updated HPD is planned to undergo a third-party verification upon completion.

For more information and to access all certifications and sustainability initiatives, please visit:
<http://www.aristechsurfaces.com/avonite/technical-library>



Upper Canada Forest Products (UCFP) Office Installation, Photographer: Igor Pona Architectural Photography

SUPPORTING TECHNICAL INFORMATION

Unit processes are developed with SimaPro 8.3 software, drawing upon data from multiple sources. Primary data were provided by Aristech for their manufacturing, upstream transport, and distribution processes. The primary sources of secondary LCI data are from Ecoinvent.

Table 6. LCI datasets and associated databases used to model the Avonite Surfaces® product system.

Flow	Dataset	Data Source	Publication Date
Product Materials			
Alumina trihydrate	Aluminium hydroxide {GLO} production Alloc Rec, U	Ecoinvent 3.3	2016
Methyl methacrylate	Production of methyl methacrylate, European production mix	PlasticsEurope	2014
Additives	Chemical, organic {GLO} production Alloc Rec, U	Ecoinvent 3.3	2016
Packaging			
Protection Film	Packaging film, low density polyethylene {RoW} production Alloc Rec, U	Ecoinvent 3.3	2016
Wooden Pallet	EUR-flat pallet {RoW} production Alloc Rec, U	Ecoinvent 3.3	2016
Electricity/Heat/Resources for Manufacturing			
Electricity	Electricity, medium voltage, at grid/SRTV 2015 U	Ecoinvent 3.3; SCS	2016; 2015
Natural Gas	Heat, district or industrial, natural gas {GLO} market group for Alloc Rec, U	Ecoinvent 3.3	2016
Propane	Propane, burned in building machine {GLO} market for Alloc Rec, U	Ecoinvent 3.3	2016
Water	Tap water {RoW} market for Alloc Rec, U	Ecoinvent 3.3	2010
Fabrication			
Electricity	Electricity, medium voltage {US} market group for Alloc Rec, U	Ecoinvent 3.3	2016
Adhesive	Production of methyl methacrylate, European production mix	PlasticsEurope	2014
Use			
Surface Cleaner	Water, deionised, from tap water, at user {RoW} market for water, deionised, from tap water, at user Alloc Rec, U; Citric acid {GLO} market for Alloc Rec, U; Potassium hydroxide {GLO} market for Alloc Rec, U; Chemical, organic {GLO} market for Alloc Rec, U	Ecoinvent 3.3	2016
Soap	Soap {GLO} market for Alloc Rec, U	Ecoinvent 3.3	2016
Water	Tap water {RoW} market for Alloc Rec, U	Ecoinvent 3.3	2016
Transportation			
Road	Transport, freight, lorry 16-32 metric ton, EURO4 {GLO} market for Alloc Rec, U	Ecoinvent 3.3	2016
Ship	Transport, freight, sea, transoceanic ship {GLO} market for Alloc Rec, U	Ecoinvent 3.3	2016
Rail	Transport, freight train {US} market for Alloc Rec, U	Ecoinvent 3.3	2016



Retail – No Smoking Directional Sign – Abdali Mall; Architect: Gensler Architects; Fabricator: Rosskopf+Partner AG; Photo: Abdali Mall Company

Data Quality

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	Manufacturer data (primary data) are based on 2017 annual production. Representative datasets (secondary data) used for upstream and background processes are generally less than 10 years old. All of the data used represented an average of at least one year's worth of data collection.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Representative data used in the assessment are representative of US, Europe, Global, or "Rest-of-World" (average for all countries in the world with uncertainty adjusted). Datasets chosen are considered sufficiently similar to actual processes.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one year and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	Except where noted, the LCA model included all known mass and energy flows. In some instances, surrogate data used to represent upstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 10% of the total environmental impact for each indicator are excluded. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	<p>Data used in the assessment represent typical or average processes as currently reported from multiple data sources, and are therefore generally representative of the range of actual processes and technologies for production of these materials.</p> <p>Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction. Some proxy datasets are used to represent materials due to the lack of data available.</p>
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	For manufacturing and packaging, primary data were provided by Aristech. Similarly, the upstream transport of materials is based on primary data provided by Aristech. The fabrication process was derived from a fabrication manual provided by Aristech to derive key parameters for calculations. Where primary data were unavailable, secondary data were used. The principal source of secondary LCI data is Ecoinvent and PlasticsEurope.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to the product materials and packaging is low. Data for upstream operations relied upon use of existing representative datasets. These datasets contained relatively recent data (<10 years), but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact methods required by the PCR include impact potentials, which lack characterization of providing and receiving environments or tipping points.

Allocation

Resource use at the Florence, Kentucky facility (e.g., water and energy) was allocated to the product based on the product weight as a fraction of the total facility production.

Impacts from transportation were allocated based on the mass of material and distance transported.

System boundaries

The system boundaries of the life cycle assessment for the countertop is cradle-to-grave. A description of the system boundaries for this EPD are as follows:

- **Material acquisition and pre-processing stage** – This stage includes extraction of virgin materials and reclamation of non-virgin feedstock. Resource use, emissions, and generated wastes associated with extraction and processing of the raw materials are included. All upstream transportation, including transportation to the manufacturing facility, is included.
- **Construction stage** – This stage includes all the relevant manufacturing and fabrication processes. Resource use, emissions, and generated wastes associated with these processes are included. Transport of semi-finished products between facilities and materials used in packaging of the product are included. Production of capital goods, infrastructure, production of manufacturing equipment, and personnel related activities are excluded.
- **Installation stage** – This stage includes the delivery of the countertop to the point of installation, and energy and ancillary materials used during installation. Waste generated during countertop installation is included. Sinks, plumbing fixtures, and cook tops are excluded.
- **Use stage** – The use stage includes the cleaning of the countertop during its lifetime, as well as extraction, manufacturing and transport of all sundry material for cleaning. In accordance with the PCR, maintenance and repair of the countertop is generally insignificant and is excluded from this stage. The reference service life for the countertop in this EPD is 10 years.
- **End-of-life stage** – The end-of-life stage includes the transport of the countertop and its original packaging to end-of-life processes including landfill, incineration, and recycling.

Cut-off criteria

According to the PCR, mass and energy flows that consist of less than 1% may be omitted from the inventory analysis. Cumulative omitted mass or energy flows shall not exceed 5%. In the present study, except as noted, all known materials and processes were included in the life cycle inventory.



Food Service Counter; Photo: Rubios Coastal Grill

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