

ENVIRONMENTAL PRODUCT DECLARATION

CORIAN[®] SOLID SURFACE



Corian[®] Evening Prima

Functional unit is 1 m² (10.8 ft²) of product for a period of 10 years in use.



At DuPont, we lead by example—creating innovative, sustainable solutions while reducing our footprint and supporting communities in which we operate around the world. Corian[®] solid surface material is the result of a scientific quest to create solid-surface material for residential and commercial designs of surpassing beauty. Specially engineered to be both visually stunning and long-lasting, Corian[®] comes in more than a hundred colors and patterns, and can be custom-cut and installed for limitless design possibilities.

At DuPont, we are innovating so you can achieve sustainable designs without sacrificing durability or beauty. The Corian[®] Terra Collection is made with a minimum of 6% pre-consumer-recycled content—and some colors contain significantly more. In addition, these nonporous surfaces, when properly cleaned, do not promote the growth of mold and mildew, making them ideal choices for public spaces, homes, healthcare and food preparation facilities, hospitality, schools and offices. Corian[®] exterior cladding offers many advantages for ventilated façade applications.

We have committed to reducing our footprint, and encourage our partners and suppliers to work with us to enhance sustainability throughout our supply chain and theirs.



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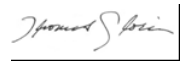
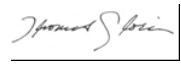


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This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.



PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	DuPont
DECLARATION NUMBER	4787059050.103.1
DECLARED PRODUCT	Corian® solid surface
REFERENCE PCR	NSF International. (2013). PCR for Residential Countertops.
DATE OF ISSUE	July 11, 2017
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	NSF
	PCR Review Panel
	ncss@nsf.org
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Wade Stout, UL Environment
	 Thomas P. Gloria, Industrial Ecology Consultants
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas P. Gloria, Industrial Ecology Consultants

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Key Environmental Parameters

Key environmental parameters are summarized upfront in Table 1.

Table 1: Key environmental parameters

Parameter	Amount
Global warming [kg CO ₂ eq.]	94.2
Primary energy demand [MJ]	1,850
Post-consumer recycled content percentage [%]	0%

Company Description

DuPont is a science company dedicated to solving challenging global problems, while creating measurable and meaningful value for its customers, employees and shareholders. Our dynamic portfolio of products, materials and services meets the ever-changing market needs of diverse industries in more than 90 countries. We unite around a set of core values—safety and health, environmental stewardship, highest ethical behavior and respect for people—just as we have for two centuries.

Agricultural systems that yield ample, safe and nutritious food while reducing the impact on the environment. Abundant, sustainable energy that decreases our dependence on non-renewable sources. Protection for the things that matter most—the planet and its inhabitants. DuPont creates products and services that help meet these needs. And we are resolved to meet these needs responsibly, working directly in the communities in which we operate. We have committed to reducing our footprint, and encourage our partners and suppliers to work with us to enhance sustainability throughout our supply chain and theirs.

Product Specifications

Product Description

Corian® is a solid, nonporous, homogeneous surfacing material, composed of $\approx 1/3$ acrylic resin (also known as polymethyl methacrylate or PMMA), and $\approx 2/3$ natural minerals. These minerals are composed of aluminum trihydrate (ATH) derived from bauxite, an ore from which aluminum is extracted.

Corian® is an advanced composite product used as an architectural and design material in a variety of residential and commercial applications. Corian® solid surface offers design versatility, functionality and durability. Supplied in sheets and shapes, it can be fabricated with conventional woodworking tools into virtually any design. It is the original solid surface material made only by DuPont.

Flowing, virtually seamless, organic shapes, bold effects of color and translucency—if it can be imagined, it can be created with Corian®. Corian® is available in a vast range of trendsetting patterns and tones, as well as your own custom-designed colors. In baths and kitchens and beyond, throughout homes and hospitals, restaurants, and public spaces, Corian® solid surfaces deliver high performance and outstanding aesthetics. Corian® continues to evolve and to inspire unprecedented creative flights of design fancy, combined with functionality.



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From meeting the certification standards of UL Environment for GREENGUARD and GREENGUARD GOLD to the Terra Collection being certified by Scientific Certification Systems (SCS) for recycled acrylic resin content, Corian® Design surfaces give more sustainable design options. Builders who use “Home Innovation NGBS Green Certified” Corian® products can earn points toward certification to the National Green Building Standard™. Corian® may help contribute to U.S. Green Building Council (USGBC) LEED® points. Corian® is NSF/ANSI Standard 51 Certified for the strictest level – Food Zone.

Application

Corian® can be used in residential applications, including kitchens and bathrooms, as well as in commercial applications for both horizontal and vertical installations. Corian® is the ideal choice for public spaces, homes, healthcare and food preparation facilities, hospitality, schools and offices. In addition, Corian® exterior cladding offers many advantages for ventilated façade applications.

Product Photos



Figure 1: Corian® solid surface in its various applications



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Product Characteristics

Corian® conforms to the following technical specifications for solid surface:

- NSF/ANSI 51 – Food equipment materials
- ISO 19712-1 Classification and specification of solid surfaces
- ISO 19712-2 Classification and specification of sheets
- CSA B45.5-17/IAPMO Z124-2017 Plastic plumbing fixtures
- ISFA-2-01 (2013) Classification and standards for solid surfacing material
- ISFA-2-02 (2013) Fabrication standards for solid surfacing material
- EN 13310 Kitchen sinks. Functional requirements and test methods
- EN 14688 Sanitary appliances. Wash basins. Functional requirements and test methods
- BS EN 14516 Baths for domestic purposes
- BS EN 14527 Shower trays for domestic purposes

Technical details and product characteristics are detailed in Table 2 and Table 3. Additional information on Corian® performance properties can be found online.

Table 2: Solid surface characteristics

Characteristic	Nominal Value	Unit
Primary material thickness	6 – 19 (0.25 – 0.75)	mm (inch)
Sheet length	183 – 366 (72 – 144)	cm (inch)
Sheet width	76 – 93 (30 – 36.6)	cm (inch)
Primary material weight	10,700 – 32,100 (2.2 – 6.6)	g/m ² (lbs./ft. ²)
Underlayment included	None	–
Underlayment type	None	–
VOC emissions test method	UL 2818 - 2013 Standard for Chemical Emissions for Building Materials, Finishes and Furnishings ANSI/BIFMA M7.1-2011(R2016) and determined to comply with ANSI/BIFMA X7.1-2011(R2016) and ANSI/BIFMA e3-2014e Credit 7.6.1, 7.6.2, and 7.6.3 in an Open Plan Office Environment. Products also determined compliant in accordance with California Department of Public Health (CDPH) Standard Method V1.1-2010 in the office environment.	
Other characteristics	GREENGUARD and GREENGUARD GOLD certification	



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Table 3: Additional solid surface characteristics

Characteristic	Nominal Value	Test Method
Bulk density	1.7 g/cm ³	ASTM D792
Linear thermal expansion	3.9 × 10 ⁻⁵ m/m °C (2.2 × 10 ⁻⁵ in. / in. °F)	ASTM E228
Hardness, Rockwell "M" scale	> 85	ASTM D785
Hardness, Barcol impressor	56	ISO 19712-2 (ASTM D2583)
Flexural strength	10,000 psi	ASTM D790
Flexural modulus	1.2 × 10 ⁶ psi	
Tensile modulus	1.5 × 10 ⁶ psi	ASTM D638
Tensile strength	6,000 psi	
Tensile elongation	0.4% min	
Compressive strength	16,000 psi	ASTM C365
Ball impact resistance: Sheets No fracture – ½ lb. ball – 6mm sheet	36 in. (no failure at height)	NEMA LD 3-3.8
Ball impact resistance: Sheets No fracture – ½ lb. ball – 12mm sheet	144 in. (no failure at height)	
Consistency of color	Pass	ISFA SST 2.1-00
Flatness of sheets	Pass	ISFA SST 4.1-00
Visual defects	Pass	ISFA SST 5.1-00
Wear and cleanability	Pass	CSA B45.5-17/IAPMO Z124-2017
Stain resistance	Pass	
Light resistance	Pass	ISO 19712-2
Stain / chemical resistance test	Pass	
Resistance to cigarette burns	Pass	
Resistance to dry heat	Pass	
Resistance to wet heat	Pass	
Hot/cold cycle water-resistance test	Pass	
Load test	Pass	
Dimensional stability	Pass	ISO 4568-2



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Characteristic	Nominal Value	Test Method
Resistance to surface wear	Pass	
Fungal resistance	ASTM rating of 0, no observed growth on product at 100x power	ASTM G21
Bacterial resistance	No observed growth on product at 100x power	ASTM G22
Microbial resistance	Highly resistant to mold growth	UL 2824 (ASTM D6329)
Coefficient of friction (slip resistance), dry conditions	0.94 - 0.95 (matte finish)	ASTM C1028
Coefficient of friction (slip resistance), wet conditions	0.50 - 0.64 (matte finish)	
Boiling water resistance	No visible change	NEMA LD 3-3.5
High temperature resistance	No change	NEMA LD 3-3.6
Flammability: all colors	Class A	NFPA 101®: Life Safety Code®
Flame spread index (FSI)	FSI < 25	ASTM E84, NFPA 255 & UL 723
Smoke developed index	SDI < 25	
Flame spread value (FSV)	FSV = 0	CAN/ULC-S102.2
Smoke developed value (SDV)	SDV = 5	

Material Content

Corian® is an acrylic solid surface. It is composed primarily of an inert material held together with an acrylic binder. Various pigments are included, along with catalysts and processing materials. Ingredients are summarized in Table 4.

Table 4: Corian® material composition

Material	Mass [%]	Mass [kg]
Alumina trihydrate, inert mineral material	60%	12 kg
Acrylic resin	38%	8 kg
Other ingredients	2%	0.4 kg

Solid Surface Production

Corian® product sold in North America is produced at two facilities in the US, and other facilities in Japan, Korea, and Turkey. Production is weighted by North American sales in 2015. At the facilities, raw materials are mixed, cast, cured, and cut into sheet. The sheets are then polished before being packaged for distribution.



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Underlying Life Cycle Assessment

The analysis was conducted according to the NSF product category rule for residential countertops (NSF International, 2013) and accompanying addendum (UL, 2017). The analysis represents the average environmental performance of Corian® from DuPont's facilities, as weighted by sales to North America. Since sales data was obtained for the 2015 calendar year, the Turkey facility was not included in primary data collection as DuPont only started importing product from Europe in early 2017. All colors and sheet dimensions are included.

Functional Unit

The functional unit is 1 m² (10.76 ft²) of 12-mm thick surface for a period of 10 years in use.

System Boundary

The analysis represents the cradle-to-grave life cycle of Corian®. The following life cycle stages are included in the analysis:

- **Material Acquisition and Pre-Processing:** This stage includes the extraction of materials from nature, processing required to create the raw materials used in surfaces production, and transportation of the materials to the construction stage. Any processing of secondary materials used in surfaces production is also included.
- **Construction:** During construction, raw materials for the countertop are processed into sheet. The stage also includes production and inbound transport of packaging materials.
- **Installation:** The installation stage starts with the transportation of the sheet to a warehouse, distributor, and/or fabricator. The fabricator, who is responsible for customizing the sheet, is assumed to travel to the installation site to take initial measurements. These measurements are used to customize the sheet back at the fabrication facility. Since Corian® is used for more than residential countertops, a 10% scrap rate is assumed. Lastly, the customized sheet is transported to the installation site and installed with Corian® Joint Adhesive.
- **Use and Maintenance:** Use includes product maintenance—typically cleaning with tap water and soap—over the 10-year timeframe. No sealing or additional maintenance is needed.
- **End-of-Life:** The end-of-life stage includes the disposal of the surface, as well as the disposal of packaging from installation. Corian® is assumed to be disposed entirely to landfill or incinerated.

Cut-off Criteria

Cut-off criteria as defined by the PCR permit omission of mass and energy flows that represent less than 1% of inputs. In practice, all inputs were considered with the exception of the landfilled plastic output from the Midwestern production facility, which was cut off as the facility itself accounts for less than 5% of North American sales volume and it was unclear whether this was associated with DuPont's product or another product manufactured at the facility.

Allocation

Facility inputs were allocated based on DuPont's engineering judgment. The cut-off allocation approach was used to address secondary material use, as well as any packaging material recycling at end-of-life.



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Background Data

Background datasets for upstream and downstream data are representative of the years 2009 – 2015 and were obtained from the GaBi 2016 databases (thinkstep, 2016).

Data Quality

A variety of tests and checks were performed throughout the project to ensure high quality of the completed LCA. Checks included an extensive review of project-specific LCA models as well as the background data used.

Data included first-hand industry data from DuPont in combination with consistent background life cycle inventory information from the GaBi 2016 databases. The data are representative of Corian® produced for the North American market in 2015.



Life Cycle Assessment Results and Analysis

Life cycle assessment results are presented per the functional unit.

Materials Resources

Materials resources, listed in Table 5, consist of all of the elementary flows included in the entire product system. Virgin renewable resources consist largely of air and carbon dioxide needed in materials acquisition, while virgin non-renewable resources mainly consist of rock and mineral resources. Recycled materials consist of secondary paper used in product packaging.

Table 5: Corian® materials resource results per functional unit

	Units	Materials acquisition	Construction	Installation	Use & maint.	End-of-life	Total
Virgin renewable resources	kg	3.44E+02	2.53E+02	2.22E+01	2.96E+00	2.92E+01	6.51E+02
Recycled resources	kg	-	1.97E-01	-	-	-	1.97E-01
Virgin non-renewable resources	kg	2.12E-01	4.03E-02	1.73E-02	1.35E-03	2.85E-02	3.00E-01



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Energy Consumption

Table 6: Corian® energy consumption results per functional unit

	Units	Materials acquisition	Construction	Installation	Use & maint.	End-of-life	Total
Non-renewable							
Fossil-fuel based	MJ	1.30E+03	1.86E+02	1.61E+02	6.86E+00	2.09E+01	1.68E+03
Nuclear	MJ	3.91E+01	4.13E+01	1.11E+01	2.05E-01	1.09E+00	9.28E+01
Renewable							
Solar	MJ	1.74E+01	4.67E+00	6.50E+00	4.25E-02	7.80E-01	2.94E+01
Wind	MJ	9.37E+00	2.45E+00	1.79E+00	3.73E-02	2.45E-01	1.39E+01
Hydro	MJ	7.15E+00	9.26E+00	2.05E+00	3.77E-02	2.27E-01	1.87E+01
Biomass	MJ	-	1.88E+01	-	-	-	1.88E+01
Geothermal	MJ	8.21E-01	1.55E-02	3.93E-01	6.72E-03	2.98E-02	1.27E+00

Impact Assessment

Impact assessment results are listed in Table 7. Acidification potential (AP), photochemical ozone creation potential (POCP), eutrophication potential (EP), and ozone depletion potential (POCP) results were calculated using the TRACI 2.1 methodology. Global warming potential (GWP) results were calculated based on the 5th assessment report of the Intergovernmental Panel on Climate Change (IPCC), and abiotic depletion potential (ADP) results are based on CML 2001 (v4.7, January 2016).

Table 7: Corian® impact assessment results per functional unit

	Units	Materials acquisition	Construction	Installation	Use & maint.	End-of-life	Total
GWP	kg CO ₂ eq.	6.08E+01	1.42E+01	1.24E+01	2.96E-01	6.46E+00	9.42E+01
AP	kg SO ₂ eq.	2.08E-01	3.52E-02	4.12E-02	5.37E-04	1.19E-02	2.97E-01
POCP	kg O ₃ eq.	2.70E+00	1.00E+00	9.50E-01	9.41E-03	1.34E-01	4.79E+00
EP	kg N eq.	1.11E-02	7.72E-03	3.82E-03	4.46E-05	1.50E-03	2.42E-02
ODP	kg R11 eq.	3.56E-09	4.90E-09	1.32E-09	2.28E-11	1.05E-10	9.90E-09
ADP, elements	kg Sb eq.	5.62E-05	5.24E-06	2.73E-06	3.70E-07	5.27E-07	6.51E-05
ADP, fossil	MJ	1.30E+03	1.86E+02	1.61E+02	6.86E+00	2.09E+01	1.68E+03



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Emissions and Wastes

Table 8: Corian® emissions and wastes per functional unit

	Units	Materials acquisition	Construction	Installation	Use & maint.	End-of-life	Total
Emissions to air							
SO _x	kg	-	1.70E-04	-	-	-	1.70E-04
SO ₂	kg	1.19E-01	1.81E-02	1.17E-02	2.62E-04	2.40E-03	1.51E-01
NO _x	kg	1.06E-01	1.93E-02	3.67E-02	3.57E-04	5.14E-03	1.67E-01
CO ₂	kg	5.47E+01	1.31E+01	1.19E+01	2.65E-01	5.12E+00	8.50E+01
CO ₂ (biogenic)	kg	1.36E+00	1.34E+00	4.59E-01	1.06E-02	5.37E-01	3.71E+00
Methane	kg	1.86E-01	3.34E-02	1.46E-02	1.00E-03	2.99E-03	2.38E-01
N ₂ O	kg	1.97E-03	-6.48E-05	2.39E-04	4.85E-06	2.53E-05	2.17E-03
CO	kg	4.30E-02	8.63E-03	2.48E-02	1.73E-04	3.20E-03	7.98E-02
Emissions to water							
Phosphates	kg	1.16E-04	3.28E-05	2.30E-04	3.19E-07	1.04E-05	3.90E-04
Nitrates	kg	2.10E-03	2.35E-03	9.32E-04	1.82E-05	1.03E-04	5.51E-03
Dioxin	kg	1.85E-19	3.50E-21	8.84E-20	1.51E-21	6.70E-21	2.85E-19
Heavy metals, As	kg	2.90E-05	1.37E-06	9.37E-06	1.32E-07	7.06E-07	4.06E-05
Heavy metals, Cd	kg	1.81E-05	1.52E-06	4.18E-06	9.35E-08	3.52E-07	2.43E-05
Heavy metals, Cr	kg	1.91E-03	3.20E-04	7.19E-05	1.18E-05	1.77E-05	2.33E-03
Heavy metals, Pb	kg	3.43E-05	5.77E-06	6.91E-06	1.86E-07	5.77E-07	4.77E-05
Heavy metals, Hg	kg	2.70E-07	7.95E-08	4.15E-08	1.97E-09	4.20E-09	3.97E-07
Water input	kg	1.95E+04	1.12E+04	2.61E+03	7.95E+01	5.95E+02	3.40E+04
Freshwater consumption	kg	1.95E+02	8.08E+01	5.17E+01	2.06E+01	1.47E+01	3.63E+02
Waste management							
Incineration	kg	-	1.45E-02	4.53E-01	-	4.09E+00	4.56E+00
Landfill (non-hazardous waste)	kg	-	-	1.81E+00	-	1.85E+01	2.03E+01
Hazardous waste	kg	-	1.89E-01	-	-	-	1.89E-01
Landfill avoidance (recycling)	kg	-	1.43E+01	-	-	-	1.43E+01



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Interpretation

Production of raw materials, particularly the acrylic resins, is a key contributor to all impact categories considered, though to a lesser extent for smog formation and eutrophication potentials. Distribution of the Corian® sheet to the customization facility is also a significant, though lesser, contributor to smog formation. Electricity generation, and specifically the generation of hydropower, is a significant contributor to water consumption due to evaporation from reservoirs.

The analysis results represent the cradle-to-grave environmental performance of Corian® as produced by DuPont and sold in North America. Primary data from 2015 were collected from four of DuPont's facilities—two in the US, one in Korea, and one in Japan. No data were collected from DuPont's Turkey facility as this facility did not start shipping product to North America until 2017. If the Turkey facility were included, however, doing so is not expected to significantly change results as it would account for a small fraction of sales volume.

Additional Environmental Information

No toxicity impact category results are calculated, although one may reference Corian® Acrylic Solid Surface HPD (DuPont, 2017). Material ingredients are disclosed in the Material Content section under the Product Specifications section.

Although the analysis assumes that the surface, at end-of-life, is disposed to landfill or incinerated, the material can also be re-purposed.

Additionally, DuPont holds the following certifications and partnerships.



NGBS Green Partner



SCS Global Services
Certification for
Recycled Content



GREENGUARD Gold
Certification for Low
Chemical Emissions



NSF Certification for
Food Contact



ISO 14001
Responsible Care
Management System

Additional information, including product details and company information, can be found at www.dupont.com.



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References

- DuPont. (2017). *Corian® Health Product Declaration*. Retrieved from http://www.corian.com/IMG/pdf/corian_acrylic_solid_surface_hpd_updated.pdf
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