



Registration Number: DAP 006:2021



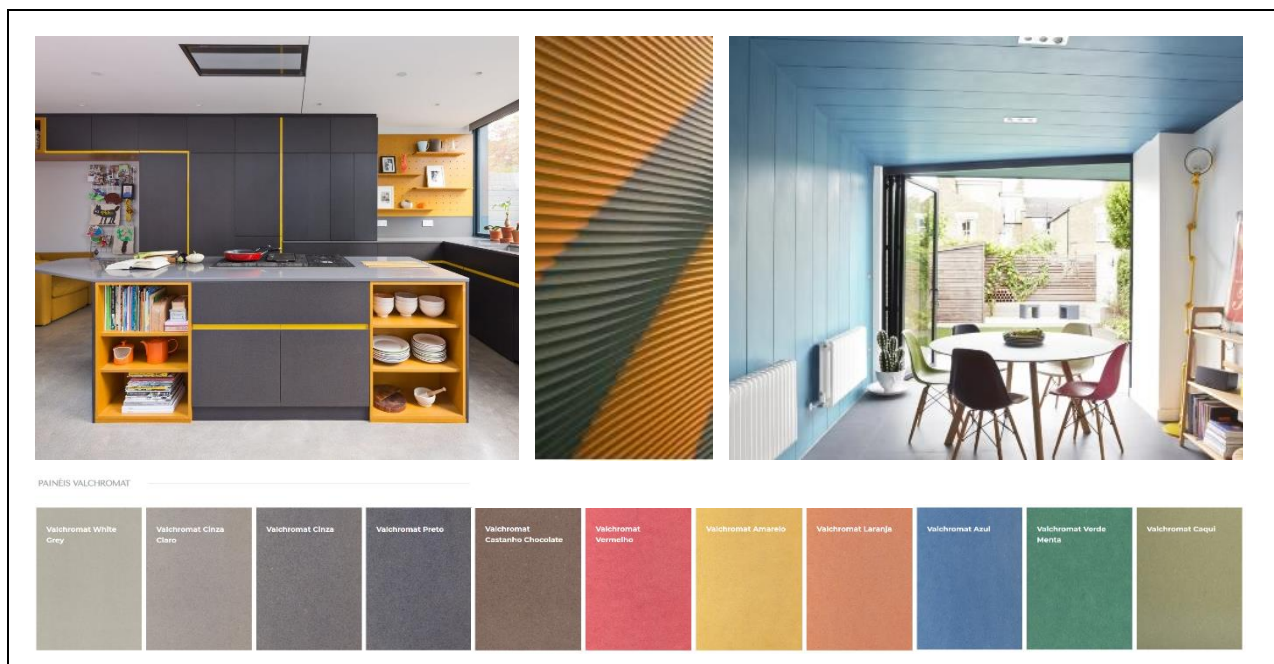
## Colored wood fibers panel

### Valchromat® and Valchromat® Fire Retardant

ISSUE DATE: 14/12/2021

VALID UNTIL: 13/12/2026

VALBOPAN - FIBRAS DE MADEIRA, S.A.





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## 1. GENERAL INFORMATION

### 1.1. The DAPHabitat System

<b>Program operator:</b>	Sustainable Construction Platform <a href="http://www.centrohabitat.net">www.centrohabitat.net</a> <a href="mailto:centrohabitat@centrohabitat.net">centrohabitat@centrohabitat.net</a>	 Plataforma para a Construção Sustentável
<b>Address:</b>	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro	
<b>Email address:</b>	<a href="mailto:deptecnico@centrohabitat.net">deptecnico@centrohabitat.net</a>	
<b>Telephone number:</b>	(+351) 234 401 576	
<b>Website:</b>	<a href="http://www.daphabitat.pt">www.daphabitat.pt</a>	
<b>Logo:</b>		

### 1.2. EPD owner

<b>Name of the owner:</b>	Valbopan – Fibras de Madeira, S.A.
<b>Production site:</b>	Quinta do Castelo Famalicão, 2450-025, Famalicão Nazaré, Portugal
<b>Address (head office):</b>	Quinta do Castelo Famalicão, 2450-025, Famalicão Nazaré, Portugal
<b>Telephone:</b>	(+351) 213 190 140
<b>E-mail:</b>	info@investwood.pt
<b>Website:</b>	<a href="https://www.investwood.pt">https://www.investwood.pt</a>
<b>Logo:</b>	
<b>Information concerning the applicable management Systems:</b>	ISO 9001:2015 – Sistemas de Gestão da Qualidade
<b>Specific aspects regarding the production:</b>	CAE Principal 16212 – Manufacture of wood fiber panels CAE Secundário 16102 – Wood impregnation

**Organization's environmental policy:**

Valbopan seeks to constantly improve customer satisfaction by continuously enhancing its methods and processes.

It promotes the use of wood from forests managed-with sustainable methods and all legal requirements and regulations are complied.

The supply and use of wood produced near the plant is a priority to avoid long delivery routes, thus benefiting the environment.

Valbopan has a system in place to guarantee compliance with the chain of custody requirements, in accordance with the FSC STD-40-004, FSC STD-40-005 and PEFC ST 2002:2013 standards.


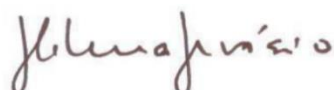
Valbopan Portugal undertakes not to acquire wood coming from:

- Forests where civil or traditional rights are violated;
- Forests with high conservation value, threatened by forest management activities;
- Genetically modified trees (GMOs);
- Illegally exploited forests;
- Forests resulting from the conversion of natural forests into plantations or non-forest uses.


### 1.3. Information concerning the EPD

<b>Authors:</b>	1. Centro Tecnológico da Cerâmica e do Vidro 2. Valbopan – Fibras de Madeiras, S.A.
<b>Contact of the authors:</b>	1. CTCV materials: habitat   iParque – Parque Tecnológico de Coimbra - Lote 6   3040-540 Antanhol – Portugal (T) +351 239 499 200 Marisa Almeida: marisa@ctcv.pt 2. Valbopan – Fibras de Madeiras, S.A. Quinta do Castelo Famalicão, 2450-025, Famalicão Nazaré, Portugal (T) +351 213 190 140 info@investwood.pt
<b>Emission date:</b>	14/12/2021
<b>Registration date:</b>	14/02/2022
<b>Registration number:</b>	DAP 006:2021
<b>Valid until:</b>	13/12/2026
<b>Representativity of the EPD (location, manufacturer, group of manufacturers):</b>	EPD of one (1) product class, produced in one (1) industrial plants belonging to one (1) sole producer (Valbopan – Fibras de Madeiras, S.A.).
<b>Where to consult explanatory material:</b>	<a href="https://www.investwood.pt">https://www.investwood.pt</a>
<b>Type of EPD:</b>	EPD from cradle to gate (A1-A3)

### 1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2009 and EN 15804:2012+A1:2015	
<b>Certification Body</b>	<b>Verifier (s)</b>
	
(CERTIF – Associação para a Certificação)	(Helena Gervasio)

### 1.5. EPD Registration


<b>Program Operator</b>

(Plataforma para a Construção Sustentável)

## 1.6. PCR of reference

<b>Name:</b>	EN 16485:2014 – Round and sawn timber – Environmental Product Declarations – Product category rules for wood and wood-based products for use in construction (CEN, 204).
<b>Emission Date:</b>	April, 2014
<b>Number of registration on the data base:</b>	-
<b>Version:</b>	-
<b>Identification and contact of the coordinator(s):</b>	-
<b>Identification and contact of authors:</b>	-
<b>Composition of the sectorial panel:</b>	-
<b>Período de consulta:</b>	-
<b>Valid until:</b>	-



## 1.7. Information concerning the product/product class

<b>Identification of the product:</b>	Valchromat® and Valchromat® Fire Retardant panel																																																																																																					
<b>Illustration of the product:</b>																																																																																																						
<b>Brief description of the product:</b>	<p>Valchromat® and Valchromat® Fire Retardant panels are made from maritime pine wood fibers (<i>Pinus pinaster Ait.</i>). The fibers are impregnated with organic dyes and-bonded by resins.</p> <p>Valchromat® and Valchromat® Fire Retardant panels are moisture resistant, technical class MDF.HLS, supplied without finishing.</p>																																																																																																					
<b>Main technical characteristics of the product:</b>	<p><b>Table 1. Technical properties of Valchromat® and Valchromat® Fire Retardant panels</b></p> <table border="1" data-bbox="448 748 1398 1453"> <thead> <tr> <th rowspan="2">Properties</th> <th rowspan="2">Units</th> <th colspan="5">Valchromat® / Valchromat® Fire Retardant (*)</th> <th rowspan="2">Standard</th> </tr> <tr> <th>8 (*)</th> <th>12 (*)</th> <th>16 (*)</th> <th>19 (*)</th> <th>30</th> </tr> </thead> <tbody> <tr> <td>Thickness</td> <td>mm</td> <td>8 (*)</td> <td>12 (*)</td> <td>16 (*)</td> <td>19 (*)</td> <td>30</td> <td>-</td> </tr> <tr> <td>Density</td> <td>Kg/m<sup>3</sup></td> <td>830</td> <td>800</td> <td>780</td> <td>770</td> <td>720</td> <td>EN 323</td> </tr> <tr> <td>Weight per sqm</td> <td>Kg/m<sup>2</sup></td> <td>6.6</td> <td>9.6</td> <td>12.5</td> <td>14.6</td> <td>21.6</td> <td>-</td> </tr> <tr> <td>Bending strength</td> <td>N/mm<sup>2</sup></td> <td>42</td> <td>40</td> <td>38</td> <td>38</td> <td>36</td> <td>EN 310</td> </tr> <tr> <td>Modulus of elasticity in bending</td> <td>N/mm<sup>2</sup></td> <td>3400</td> <td>3200</td> <td>3100</td> <td>3100</td> <td>3000</td> <td>EN 310</td> </tr> <tr> <td>Internal bond</td> <td>N/mm<sup>2</sup></td> <td>0.80</td> <td>0.80</td> <td>0.75</td> <td>0.75</td> <td>0.75</td> <td>EN 319</td> </tr> <tr> <td>Swelling in thickness 24h</td> <td>%</td> <td>12</td> <td>10</td> <td>8</td> <td>7</td> <td>7</td> <td>EN 317</td> </tr> <tr> <td>Internal bond after cyclic test</td> <td>N/mm<sup>2</sup></td> <td>0.30</td> <td>0.25</td> <td>0.20</td> <td>0.15</td> <td>0.15</td> <td>EN 321</td> </tr> <tr> <td>Swelling in thickness after cyclic test</td> <td>%</td> <td>19</td> <td>16</td> <td>15</td> <td>15</td> <td>15</td> <td>EN 321</td> </tr> <tr> <td>Fire reaction - Valchromat®</td> <td>-</td> <td>F</td> <td colspan="4">D-s2,d0</td> <td>EN13501</td> </tr> <tr> <td>Fire reaction - Valchromat® Fire Retardant</td> <td>-</td> <td colspan="4">B-s2,d0</td> <td>-</td> <td>EN 13501</td> </tr> </tbody> </table>	Properties	Units	Valchromat® / Valchromat® Fire Retardant (*)					Standard	8 (*)	12 (*)	16 (*)	19 (*)	30	Thickness	mm	8 (*)	12 (*)	16 (*)	19 (*)	30	-	Density	Kg/m <sup>3</sup>	830	800	780	770	720	EN 323	Weight per sqm	Kg/m <sup>2</sup>	6.6	9.6	12.5	14.6	21.6	-	Bending strength	N/mm <sup>2</sup>	42	40	38	38	36	EN 310	Modulus of elasticity in bending	N/mm <sup>2</sup>	3400	3200	3100	3100	3000	EN 310	Internal bond	N/mm <sup>2</sup>	0.80	0.80	0.75	0.75	0.75	EN 319	Swelling in thickness 24h	%	12	10	8	7	7	EN 317	Internal bond after cyclic test	N/mm <sup>2</sup>	0.30	0.25	0.20	0.15	0.15	EN 321	Swelling in thickness after cyclic test	%	19	16	15	15	15	EN 321	Fire reaction - Valchromat®	-	F	D-s2,d0				EN13501	Fire reaction - Valchromat® Fire Retardant	-	B-s2,d0				-	EN 13501
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<b>Description of the products' application:</b>	<p>Valchromat® and Valchromat® Fire Retardant panels are manufactured and available in different thicknesses. Valchromat® panels are moisture resistant, supplied without finishing. These panels are used in interior design, furniture, linings, flooring, doors, bathrooms and kitchens, restaurants, exhibition stands, shopfitting, decorative panels, acoustic panels, among others.</p> <p>Whenever the panels are used in-very humid areas, such as bathrooms or kitchens, they should be protected with a varnish finishing and the tops must be properly sealed.</p> <p>Valchromat® and Valchromat® Fire Retardant panels should not be applied in places where they will come into direct contact with water, such as kitchen worktops and bathroom showers.</p>																																																																																																					
<b>Reference service life:</b>	Not specified (EPD from cradle-to-gate).																																																																																																					
<b>Placing on the market / Rules of application in the market / Technical rules of the product:</b>	EN 120 EN 310 EN 317 EN319 EN 321 EN 323 EN 13501																																																																																																					

	EN 13986
<b>Quality control:</b>	<p>Valbopan follows a medium/long-term business strategy based on the concept of sustained growth, promoting the use of wood from sustainable managed forests, and continuously improving its methodologies and processes, based on innovation and research.</p> <p>Valbopan, SA is committed to ensuring a Quality Management System (QMS) that responds to the requirements of Customers and other interested parties, to the development and continuous improvement of its services and products, complying with all legal, statutory and regulatory requirements. In addition, it assumes compliance with all the requirements of its QMS and the continuous improvement of its effectiveness.</p>
<b>Special delivery conditions:</b>	Not applicable
<b>Components and substances to declare:</b>	Not applicable
<b>History of the LCA studies:</b>	No LCA studies have been identified for similar products.

## 2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT

### 2.1. Calculation rules of the LCA

<p><b>Declared unit:</b></p>	<p>1 m<sup>3</sup> of Valchromat® and Valchromat® Fire Retardant panel, ready for dispatch. The average density varies between 720 and 830 kg/m<sup>3</sup>, with moisture content between 5.5% (thickness 8 mm) and 8.5% (thickness 30 mm).</p> <p>Following the recommendation of EN 16485 in point 6.3.2 and in accordance with EN 15804: 2012 + A1, the following conversion factor (CF) is indicated to convert the declared unit of 1 m<sup>3</sup> of Valchromat® panel to the mass unit (kg panel): CF (kg/m<sup>3</sup>) = 1/panel density.</p>
<p><b>Functional unit:</b></p>	<p>Not applicable.</p>
<p><b>System boundaries:</b></p>	<p>In general, Valchromat® and Valchromat® Fire Retardant panels follow the same production process, using some different additives that give them different special features, but starting with the same raw material, the logs of maritime pine produced in Portugal according to the best forest management practices, and according to PEFC™ and FSC® certification. All forest operations, from the preparation of the land, the conduction of forest stands, forest exploitation and establishment of the road and divisional network, were considered.</p> <p>The manufacturing process of Valchromat® and Valchromat® Fire Retardant panels occur essentially in two phases: a first phase, the wood processing to isolate the fibers and its gluing process, and a second phase, with the processes of drying, forming and pressing the panels.</p> <p>The wood processing starts with the reception and unloading of wood logs, with bark, of maritime pine produced in Portugal. The logs are debarked and sent to a chipper that turns them into chips. These pass through a magnetic separation in order to remove any metal that may be contaminating the wood, and then the chips are subjected to a screening and washing process. Diesel consumption associated with log discharges was considered. The movement of the chips is carried out by a loader.</p> <p>The bark of the logs is used in the generation of thermal energy for internal consumption throughout the production process of Valchromat® and Valchromat® Fire Retardant. During the sieving and washing processes of the chips, there is the production of residues of these chips, which, together with the bark, go for recovery in a closed cycle in-situ in the generation of thermal energy. Thus, it is considered that all the residues from the wood logs are recovered during the manufacturing process of Valchromat® and Valchromat® Fire Retardant. Part of the thermal energy generated is used to promote the cooking of the chips, with steam in order to facilitate the mechanical process of defibration in which the fibers are separated.</p> <p>Then, resins, organic dyes and other additives are added to the wood fibers, depending on the desired panel color. In the particular case of Valchromat® Fire Retardant, a specific resin and flame-retardant additive with fire retardant properties are used, this being the characteristic that distinguishes this panel from Valchromat®.</p> <p>Then, drying is carried out, using thermal energy from the valorization of the non-conforming chips and bark from the first processing phase, and the fiber mat is formed in the manufacturing line and pressed into panels. After this the panels go to stabilization and calibration to the nominal thickness. Finally, the panels are cut, packed and stored for later loading in trucks that will dispatch Valchromat® and Valchromat® Fire Retardant products.</p> <p>The consumption of electricity, water disinfectants and lubricating oils, as well as the internal movements in forklift trucks, for example, the bark and chippings discarded from the screening and washing operations for the production of thermal energy, were considered.</p> <p>The transport and treatment of waste resulting from the manufacturing process of Valchromat® and Valchromat® Fire Retardant panels, other than the non-conforming chips and bark, such as glues and paper and cardboard packaging wastes, were considered.</p> <p>The waste water resulting from the manufacturing process of Valchromat® and Valchromat® Fire Retardant panels is subjected to a pre-treatment process, before being sent to the municipal waste water treatment plant.</p>
<p><b>Criteria for the exclusion:</b></p>	<p>While carrying out the LCA, the production processes of logs, auxiliary materials and energy consumed in the manufacture of Valchromat® and Valchromat® Fire Retardant panels were considered for which inventory data was available. It should be noted that the processes not considered are covered by the exclusion criterion defined in NP EN 15804: 2012 + A1: 2015 namely because their mass is less than 1% of the total mass of the entries.</p> <p>The following processes were excluded:</p> <ul style="list-style-type: none"> <li>▪ environmental loads associated with the construction and maintenance of infrastructure and equipment (capital goods)</li> <li>▪ long-term emissions</li> </ul>

	<ul style="list-style-type: none"> <li>▪ recovery of waste - metals, ferrous metals and plastics</li> </ul>
<p><b>Assumption and limitations:</b></p>	<p>The data collected and results of the environmental impacts and other indicators presented in this EPD refer to the year of 2019.</p> <p>The production of wood waste resulting from the manufacture of Valchromat® and Valchromat® Fire Retardant panels is sent for internal recovery, thus avoiding environmental impacts associated with the final deposition of this waste. The recovery contributes to the reduction of consumption of virgin raw materials and, thus, to the preservation of natural resources.</p>
<p><b>Quality and other characteristics about the information used in the LCA:</b></p>	<p>For the processes over which the producer has an influence, that is, the manufacture of Valchromat® and Valchromat® Fire Retardant panels, real and specific data was used.</p> <p>For processes that Valbopan, SA has no total influence or specific information, such as the production of auxiliary materials (dyes, additives, lubricating oils, water disinfectants, packaging material), production of fuels and electricity, waste water treatments, treatment and recovery of waste, other than wood bark and non-conforming chips (metals, plastics, glue residues, other wastes) and transport, generic data obtained from the Ecoinvent database - version 3.3 was used.</p> <p>The generic data used comply with the data quality requirements (time span, geographic scope, plausibility, completeness, consistency, reliability of the source and differences in the data and sensitivity analysis).</p>
<p><b>Allocation rules:</b></p>	<p>The allocation rules adopted were based on the annual volumetric production of Valchromat® and Valchromat® Fire Retardant panels from Valbopan, SA.</p>
<p><b>Comparability of EPD for construction products:</b></p>	<p>EPD's for construction products and services may not be comparable if they are not produced in accordance with EN15804, EN16485 and EN15942 and in accordance with the comparability conditions determined by ISO 14025.</p>

### 2.1.1. Flow diagram of input and output of the processes

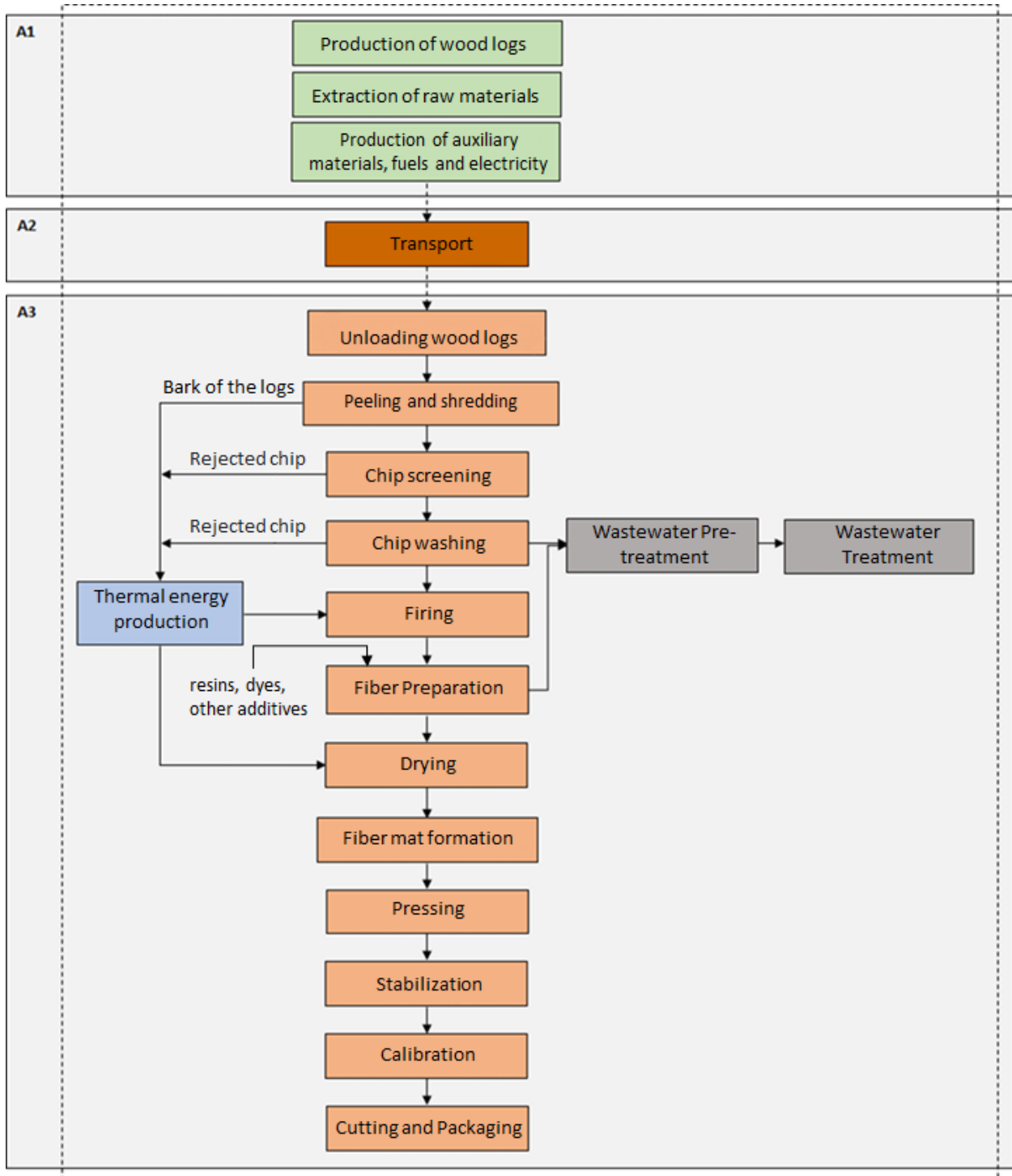


Figure 1 - Flowchart of the manufacturing process for Valchromat® and Valchromat® Fire Retardant panels.

## 2.1.2. Description of the system boundaries

(✓ = included; ✗ = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗

The inventory of the forest management system, which includes the preparation of the land, installation of the stand, conduction of the stand, forest exploitation, and establishment of the road and divisional network were considered.

Green bark logs, from pine, are received and unloaded at Valbopan, SA. In this operation, diesel is consumed on machinery that discharges pine logs. The logs are debarked and sent to a chipper that turns them into wood chips. The chips go through a magnetic separation process, so that any metal that may be contaminating the wood is removed. The metals collected go on to be valued by external operators. Then, the chips are subjected to a sieving and washing process to ensure the removal of sands. The residual water from the washing is subjected to an internal pre-treatment (WWTPi) and then the pre-treated effluent is sent to the municipal wastewater treatment plant (WWTP). The removed sands are sent for recovery to external operators.

The bark of the logs and the non-conforming chips of the sieving and washing processes are reintroduced in the manufacturing process of Valchromat® and Valchromat® Fire Retardant panels, being used for the generation of thermal energy in the boiler, for internal consumption throughout the production process. Thus, it is valued in a closed- cycle in-situ, considering that all residues from wood logs are recovered during the manufacturing process of the panels.

Then, the chips are cooked, using the thermal energy provided by the boiler, in order to defibrate the wood and isolate the fibres. After this, the isolated fibres are, prepared by adding resins, organic dyes and other additives, depending on the desired panel colour. In the particular case of Valchromat® Fire Retardant, a specific resin and flame-retardant additive are added, with fire retardant properties, this being the characteristic that distinguishes this panel from Valchromat®.

This is followed by drying, by means of an exchanger coupled to the boiler, with the release of water vapor into the atmosphere. The pollutant emissions from the dryer were obtained through 2 campaigns to characterize its gaseous effluents during the year of 2019, complemented by information provided by Valbopan, SA.

After drying, the fibre mat is formed, and then it goes to the hot pressing in two single-opening presses, with the release of water vapor. The panels are stabilized for a period of 48 hours and are subsequently calibrated to the nominal thickness.

Finally, the panels are packaged and stored for later loading in trucks that will dispatch Valchromat® and Valchromat® Fire Retardant panels.

Electricity consumption is associated with all the automatic operations described before, such as debarking, chipping and metal separation, and also with all the equipment used for the preparation of the fibre, pressing, stabilization, calibration and cutting. It should be noted that the consumption of electricity for each type of panel considers the consumption of administrative activities.

It was also considered the consumption of water disinfectants and lubricating oils used in the heat exchanger coupled to the boiler, and lubricating oils associated with the maintenance of machinery.

The waste water resulting from the manufacturing process of Valchromat® and Valchromat® Fire Retardant panels is subjected to a WWTPi process, before being sent to the WWTP. Pollutant emissions from the WWTPi were obtained through monthly analyses of the characterization of liquid effluents during 2019.


The waste produced during the manufacturing process of Valchromat® and Valchromat® Fire Retardant panels is subject to external recovery processes. For recovered waste, the impact associated with recovery should be excluded from the point in the recovery chain at which the waste reaches the end of waste status. However, given the difficulty in identifying this point in accordance with the requirements of standard EN15804:2012+A1:2013, the quantification of the impacts associated with the waste recovery processes of Valbopan, SA was carried out. However, for metal and plastic waste, no suitable processes were found in the Ecoinvent database, so their environmental impact was not considered. It should be noted that the mass flows of these wastes are less than 1% of the total mass of the inputs (exclusion criteria defined in NP EN15804:2012+A1:2015).

The transport and treatment of residues resulting from the manufacturing process of Valchromat® and Valchromat® Fire Retardant panels, other than non-conforming bark and chips, such as metals and glue residues, were considered.

## 2.2. PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS

### Valchromat®

		Global warming	Ozone layer depletion	Acidification	Eutrophication	Photochemical oxidation	Abiotic depletion	Abiotic depletion – fossil fuels
		kg CO <sub>2</sub> equiv.	kg CFC 11 equiv.	kg SO <sub>2</sub> equiv.	kg (PO <sub>4</sub> ) <sup>3-</sup> equiv.	kg C <sub>2</sub> H <sub>4</sub> equiv.	kg Sb equiv.	MJ, P.C.I.
Raw material supply	A1 – A3	977.87	1.10E-04	8.10	7.89E-01	4.96E-01	1.54E-04	18978
Transport		(*)						
Manufacturing								


LEGEND:  
 Product stage

NOTE:  
 Values expressed by declared unit (1 m<sup>3</sup> of Valchromat® panel).

(\*) Considering only fossil global warming for modules A1-A3 (977.87 kg CO<sub>2</sub> eq/m<sup>3</sup> panel). Considering biogenic carbon, a carbon balance of -597.41 kg CO<sub>2</sub> eq/m<sup>3</sup> panel is obtained.

### Valchromat® Fire Retardant

		Global warming	Ozone layer depletion	Acidification	Eutrophication	Photochemical oxidation	Abiotic depletion	Abiotic depletion – fossil fuels
		kg CO <sub>2</sub> equiv.	kg CFC 11 equiv.	kg SO <sub>2</sub> equiv.	kg (PO <sub>4</sub> ) <sup>3-</sup> equiv.	kg C <sub>2</sub> H <sub>4</sub> equiv.	kg Sb equiv.	MJ, P.C.I.
Raw material supply	A1 – A3	1462.25	1.62E-04	11.3	1.06	7.65-01	8.82E-04	27545
Transport		(*)						
Manufacturing								

LEGEND:  
 Product stage

NOTE:  
 Values expressed by declared unit (1 m<sup>3</sup> Valchromat® Fire Retardant panel).

(\*) Considering only fossil global warming for modules A1-A3 (1462.25 kg CO<sub>2</sub> eq/m<sup>3</sup> panel). Considering biogenic carbon, a carbon balance of -113.03 kg CO<sub>2</sub> eq/m<sup>3</sup> panel is obtained.

## 2.3. PARAMETERS DESCRIBING RESOURCE USE

### Valchromat®

		Primary energy						Secondary materials and fuels, and use of water			
		EPR	RR	TRR	EPNR	RNR	TRNR	MS	CSR	CSNR	Net use of fresh water
		MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	kg	MJ, P.C.I.	MJ, P.C.I.	m <sup>3</sup>
<b>Raw material supply</b>	<b>A1 – A3</b>										
<b>Transport</b>		1.52E+03	0	1.52E+03	1.97E+04	0	1.97E+04	0	0	0	0.179
<b>Manufacturing</b>											

Values expressed by declared unit (1 m<sup>3</sup> Valchromat® panel)

LEGEND:



Product stage

**EPR** = use of renewable primary energy excluding renewable primary energy resources used as raw materials;

**RR** = use of renewable primary energy resources used as raw materials;

**TRR** = total use of renewable primary energy resources (EPR + RR);

**EPNR** = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;

**RNR** = use of non-renewable primary energy resources used as raw materials;

**TRNR** = total use of non-renewable primary energy resources (EPNR + RNR);

**MS** = use of secondary material;

**CSR** = use of renewable secondary fuels;

**CSNR** = use of non-renewable secondary fuels.

### Valchromat® Fire Retardant

		Primary energy						Secondary materials and fuels, and use of water			
		EPR	RR	TRR	EPNR	RNR	TRNR	MS	CSR	CSNR	Net use of fresh water
		MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	kg	MJ, P.C.I.	MJ, P.C.I.	m <sup>3</sup>
<b>Raw material supply</b>	<b>A1 – A3</b>										
<b>Transport</b>		1.95E+03	0	1.95E+03	2.90E+04	0	2.90E+04	0	0	0	0.281
<b>Manufacturing</b>											

Values expressed by declared unit (1 m<sup>3</sup> Valchromat® Fire Retardant panel)

LEGEND:



Product stage

**EPR** = use of renewable primary energy excluding renewable primary energy resources used as raw materials;

**RR** = use of renewable primary energy resources used as raw materials;

**TRR** = total use of renewable primary energy resources (EPR + RR);

**EPNR** = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;

**RNR** = use of non-renewable primary energy resources used as raw materials;

**TRNR** = total use of non-renewable primary energy resources (EPNR + RNR);

**MS** = use of secondary material;

**CSR** = use of renewable secondary fuels;

**CSNR** = use of non-renewable secondary fuels.




## 2.4. Other environmental information describing different waste categories

### Valchromat®

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed** kg
Raw material supply Transport Manufacturing	A1 –A3	1.05E-02	0	4.42E-02


Values expressed by declared unit (1 m<sup>3</sup> of Valchromat® panel)

LEGEND:  
 Product stage  
 \*\* The radioactive waste component does not come from the activity of Valbopan (A3). It is a component derived from the upstream activities (A1 and A2), namely from the production of electricity.

### Valchromat® Fire Retardant

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed** kg
Raw material supply Transport Manufacturing	A1 –A3	1.56E-02	0	6.94E-02

Values expressed by declared unit (1 m<sup>3</sup> Valchromat® Fire Retardant panel)

LEGEND:  
 Product stage  
 \*\* The radioactive waste component does not come from the activity of Valbopan (A3). It is a component derived from the upstream activities (A1 and A2), namely from the production of electricity.

## 2.5. Other environmental information describing output flows

Parameters	Units*	Valchromat®	Valchromat® Fire Retardant
Components for re-use	kg	7.0	7.0
Materials for recycling	kg	2.04	2.04
Radioactive waste eliminated	kg	0	0
Materials for energy recovery	kg	13.1	13.1
Exported energy	MJ by energy carrier	0	0

\* expressed by declared unit (1 m<sup>3</sup> Valchromat® and Valchromat® Fire Retardant panel)

### 2.5.1. Biogenic Carbon

Valbopan received 41174.00 t of green bark maritime pine logs with bark in order to ensure all its panel production. Considering a moisture of approximately 50%, there are 20587.00 t of green pine logs with bark on a dry basis. Using 'Default' values of carbon (C) fraction in dry biomass of 0.50 kg C/kg biomass (CEN, 2014 a,b), considering the molecular mass of CO<sub>2</sub> and C, and biogenic carbon characterization factor of – 1 kg CO<sub>2</sub> eq/kg CO<sub>2</sub> biomass, the production of logs resulted in the storage of -37742.83 t CO<sub>2</sub> eq, which corresponds to 1790.09 kg CO<sub>2</sub> eq/m<sup>3</sup> Valchromat® panel and Valchromat® Fire Retardant.

In module A3, there is the release of a part of the biogenic carbon sequestered in the biomass. Non-conforming bark and chips used in the boiler to produce thermal energy represent 12% of the pine wood received in 2019 at Valbopan, SA. Thus, 214.81 kg CO<sub>2</sub> eq/m<sup>3</sup> Valchromat® and Valchromat® Fire Retardant panel is emitted to the atmosphere (117.17 kg wood/m<sup>3</sup> panel x 0.50 kg C/kg biomass x 44/12 x (1 kg CO<sub>2</sub>/kg CO<sub>2</sub> biomass)). Finally, the production of Valchromat® and Valchromat® Fire Retardant results in the storage of -1575.28 kg CO<sub>2</sub> eq/m<sup>3</sup> of the panel.

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