Methodology for Defining Homogeneous Materials

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REVISION HISTORY

REVISION DATE	SECTION	TYPE OF CHANGE	AUTHORIZED BY
March 2016	Initial Release		S. Klosterhaus
March 2018	3	Addition of interpretation for “Nonwoven Textiles”	S. Klosterhaus
September 2018	3	Addition of interpretation for “Glazed Ceramics”	S. Klosterhaus

1 OVERVIEW

1.1 PURPOSE AND CONTENT

This document explains how to define a product's homogeneous materials for the purposes of applying the requirements in the Cradle to Cradle Certified™ Product Standard. Homogeneous materials are referenced in several requirements, summarized below:

- With some exceptions, homogeneous materials present in a product at weight fractions of 100 ppm or greater are subject to review.
- With some exceptions, chemical substances present in any of those homogeneous materials at 100 ppm or greater are subject to review.
- Banned list substances must not be present above designated thresholds in any of a product's homogeneous materials that are subject to review.
- For most products, the percentage assessed refers to the percentage of homogeneous materials that have been assessed.
- Each of a product's homogeneous materials is designated as a biological or technical nutrient.
- Recyclability is determined at the homogeneous material level.

The purpose of clarifying the homogeneous material definition is to improve consistency among assessments, as comparable products should be assessed in the same way regardless of the assessment body completing the work.

This document includes the homogeneous material definition and general guidance, as well as a set of interpretations indicating how the definition has been applied in ambiguous or borderline cases in the past. Assessors must apply these interpretations to their future work and contact the Institute (certification@c2ccertified.org) when assessing products with ambiguous homogenous material breakdown that do not yet appear in the list of interpretations. This document will be updated as needed to reflect such additions.

1.2 SUPPORTING DOCUMENTS

The following documents are to be used in conjunction with this guidance document:

- Cradle to Cradle Certified™ Product Standard
- Any additional supporting documents and guidance posted on the C2CPII website

Visit the Cradle to Cradle Products Innovation Institute website to download the Standard documents and obtain the most current information regarding the product Standard (http://www.c2ccertified.org/product_certification/c2ccertified_product_standard).

2 HOMOGENEOUS MATERIAL DEFINITION & GENERAL GUIDANCE

2.1 DEFINITION

Homogeneous materials are defined in the Standard as follows:

Homogeneous materials are defined as materials of uniform composition throughout that cannot be mechanically disjointed, in principle, into different materials. Examples of homogeneous materials are polypropylene, steel, shampoo, glass cleaner, nylon yarn, finish, and coating. Examples of non-homogeneous materials are powder-coated steel, a printed bottle label, plywood, laminate, and chair casters.

The definition is based on the one used in the European Union's Restriction of Hazardous Substances (RoHS) legislation, which provides some additional context:

'homogeneous material' means one material of uniform composition throughout or a material, consisting of a combination of materials, that cannot be disjointed or separated into different materials by mechanical actions such as unscrewing, cutting, crushing, grinding and abrasive processes.[1]

Thus, a homogenous material does not necessarily possess uniform composition throughout, as long as the scale, structure, or distribution of the domains with differing composition do not allow for these domains to be separated from one another through mechanical means. Homogenous materials may be homogenous as viewed by the naked eye, but heterogeneous at a microscale.

Accordingly, assessors applying the definition to their projects must consider whether it would be possible to mechanically separate materials using one or more of these mechanical actions, regardless of whether the materials are likely to be separated in practice. For example, most layered products and coated products consist of multiple homogeneous materials because the layers/coatings could be separated, in principle, by sanding, even if this is not likely to occur.

While coated products are often more than one homogeneous material, this is not always the case because the scale of the substrate must be considered when determining whether the substrate and coating are separable. For example, a painted wooden table leg is considered two homogeneous materials because the paint could be sanded off, but a polyester fabric coated with liquid latex in conventional carpet construction is considered one homogeneous

[1] European Commission. Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast). 2015. http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02011L0065-20150624&from=EN.

material because the latex will infuse the fabric surrounding individual threads in a way that makes it impossible to separate them from the latex matrix through mechanical means. Similarly, coated fiberglass is considered a homogenous material since individually coated fibers are too small to manipulate and remove the coating from through mechanical processes.

2.2 SCOPE

The Standard requirements pertain to the homogeneous materials in the finished product, rather than the homogeneous materials the applicant receives from suppliers and combines during the manufacturing process. For example, if the product under review is dyed fabric, the dyed fabric is a single homogeneous material, even though the dye and the fabric were separate homogeneous materials when purchased from suppliers.

3 INTERPRETATIONS BY PRODUCT TYPE

In some cases, the appropriate way of separating a product into homogeneous materials according to the definition and guidance in section 2 is unclear. To achieve greater clarity, the following table explains how to apply this definition to a variety of ambiguous cases.

Product Type	Homogeneous Materials Interpretation
Blended textiles (more than one thread or yarn type woven together)	Each yarn or thread type is its own homogeneous material. For example, if a fabric is composed of a polyester yarn and a cotton yarn woven together, the polyester and cotton are considered separate homogeneous materials (in principle, individual yarns could be physically separated from the fabric, e.g. by pulling them out one at a time). If fibers of different types are twisted together into yarn or different types of yarn are twisted together in a multi-ply yarn or thread, the resulting multi-ply yarn or thread is one homogeneous material, because the different fibers are not separable by any mechanical process.
Carpet backing	The primary backing fiber and precoat are considered the same homogeneous material because the primary backing fiber becomes permeated by the precoat during the manufacturing process and is thus embedded within a precoat matrix in the finished product. The secondary backing is considered a separate homogeneous material.
Composite wood products	Layered composite wood products (e.g. plywood) are considered more than one homogeneous material (each layer is a homogeneous material). Non-layered composite wood materials such as MDF or particle board, in which small wood particles or fibers are uniformly distributed within a binder matrix, are regarded a single homogeneous material. However, if such a material has a surface layers or coating (such as a veneer, varnish, or paint) then that surface layer or coating counts as a separate homogenous material.
Concrete, countertops made of glass and	Any mixture of cement, admixture, and/or rock or silica-based inclusions is regarded a homogenous material regardless of the

cement, and other mixtures of cement with structural or decorative rock or silica-based inclusions	size of the inclusions. While gravel and similar sizes inclusions could in principle be separated from the matrix through mechanical means, analogous geological materials (i.e. conglomerates) are treated as homogenous materials for the purpose of assessment. Additionally, assessing types of concrete differently based on aggregate size would greatly increase the challenge of ensuring consistent application of the homogenous material definition.
Dyed textiles	Dyes and their substrates usually form a single homogeneous material, though if the dyes are surface treatments only, they can be counted as separate homogeneous materials from their substrates. For example, if a pattern is printed onto a fabric, the print is considered a separate homogeneous material from the fabric because it is resting on top of the fabric as a distinct layer that could be separated through abrasion. If the dyes instead form a single homogeneous material with their substrate (this is the more common situation), then each colored fabric option (e.g. blue fabric, purple fabric, green fabric) is its own homogeneous material.
Fiberglass	Fiberglass is considered a single homogeneous material. While the glass fibers may be coated, and therefore the composition may not be uniform throughout at the scale of an individual fiber, the glass and coating are not separable by any mechanical process.
Glazed Ceramics	Glazed ceramic is considered a single homogeneous material. While the glaze does produce a visually distinct layer on the ceramic surface, this layer is not separable by any mechanical process. There is no discrete boundary between the glaze and the body of the ceramic as the two materials physically and chemically fuse into one another during the firing/melting process. An exception exists for product applications in which the glaze is intended as a food contact surface (e.g. glazed ceramic plates or cookware). For such applications, the glaze must be assessed as a separate homogenous material since concentrations of substances in the surface glaze will be more representative than bulk concentrations in terms of exposure during the use phase.
Nonwoven Textiles	Nonwoven fabrics require a bonding step in order to create mechanical resistance in the end product. This produces one homogeneous material, because the different fibers are not separable by any mechanical process. Known bonding processes include but are not limited to: • Thermal bonding • Hydro-entanglement

	• Ultrasonic pattern bonding • Needlepunching/needlefelting • Chemical bonding • Melt-blown