



Leather Tanning Choices

Creating a socially and environmentally sustainable
leather value chain



SMIT & ZOON

Agenda:

- General Overview
- Tanning Methods
- Tanning agents compared
- Zeology Tanning

General Overview: Respect the Animal

- **Hides & skins are a natural by-product of the meat industry.**
- **The better the life of the animal the better the leather.**
- **The leather industry is working on animal welfare and traceability.**
- **Leather manufacturers upcycle the left-over hides & skins into beautiful, versatile, and valuable sustainable products.**
- **The amount of waste that goes to landfills is reduced.**

Diversity of customers and multiple choices

Leather

- Longevity ✓
- Comfort ✓
- Feeling of wellbeing ✓
- Technical specifications ✓
- Bio-content ✓



Alternative Materials

- Longevity ?
- Comfort ?
- Feeling of wellbeing ?
- Technical specifications ?
- Bio-content ?



A wide-angle photograph of a large industrial tanning facility. The room is filled with several large, horizontal, rotating drums used for tanning leather. The drums are made of metal with a green-painted frame and are supported by wooden blocks. The facility has a high ceiling with exposed steel beams and numerous hanging industrial lights. The floor is concrete with yellow safety lines. In the background, a red forklift is visible on the right side.

Tanning Methods

Traditional Vegetable Tanning

*One of the **oldest methods** of tanning known to man.*

Hides are tanned using **tannins** and other ingredients found in different vegetable matters: tree bark, wood, leaves, fruits, and roots. The ingredients can be found in many leather goods like shoes, handbags, saddles, etc., and this **artisanal way** of leather production has its unique leather smell.

Advantages

- Chrome free shavings for fertilizer
- Biobased, ingredients found in different vegetable matter, such as tree bark, wood, leaves, fruits and roots
- Unique leather smell
- Commonly used for shoes, handbags, soles
- Leather allowed to be recycled

Disadvantages

- Longer process times in the tannery
- Although biobased most vegetable tanning agents require chemical processing before usage (e.g., making the water soluble)
- Not all vegetable tanning are suitable for automotive
- Impossible to make white, light-colored leather articles
- Poor fastness properties (e.g., light fastness & heat resistance)
- High amounts of tanning agent needed
- High impact on wastewater (e.g., COD)
- Higher cost

Chrome Leather Tanning

Called wet-blue and known as the 'work horse' of the global leather industry.

Chrome has a mineral origin

Advantages

- Widely used, well known by tanneries
- Good physical properties
- Easy storable intermediates (wet-blue)
- Lighter in weight compared to vegetable tanning
- Cost-efficient
- Leather allowed to be recycled

Disadvantages

- Waste streams and cuttings contain chrome
- Risk of chrome VI formation through oxidation through not optimal process management
- Risk of allergic dermatitis to chrome
- Increased legislative pressure on chrome (waste)
- Increasing demand for chrome free leather

GDA Leather Tanning

*This tanning technology is known as **Glutaraldehyde Tanning**.*

*This leather type is also known as **wet-white** due to its pale cream color.*

Advantages

- Chrome free shaving for fertilizer
- Good physical properties (low shrinkage)
- Well adopted for automotive leather
- Leather allowed to be recycled

Disadvantages

- Effectively only as pre-tannage
- Requires more re-tannage than chrome tanning
- GDA is on the SVHC Candidate list (respiratory & skin sensitization)
- GDA is carcinogenic as a raw material (not once reacted with collagen)
- GHS labelling
- GDA has a fossil origin

Olive-Leaf Leather Tanning

*The tanning agent is made out of **olive leaves***

Advantages

- Chrome-free shaving for fertilizer
- Cradle-to-cradle certified
- Typical odour
- Leather allowed to be recycled

Disadvantages

- Impossible to make white, light-colored leather articles
- Poor fastness properties (e.g. light fastness & heat resistance)
- High amounts of tanning agent needed
- High impact on wastewater (e.g. COD)
- Higher cost than chrome and GDA leather

Zeology supply chain & Certifications



Supply Chain

Zeology sustainable sourcing and supply

- Fully established, scalable and global supply chain for Zeology
- Zeolite is built from the elements Aluminum (Al), Silicium (Si) and Oxygen (O), the most abundantly available elements in the Earth's crust (~40km thick). The three elements represent >80% of the top layer of our globe. See table
- Chrome only has a ~0,01% presence in the Earths crust (element #21)
- Aluminium/bauxite will be Supply Chain Due Diligence Act (SCDDA) conformant based on ASI certified ATH. Planned for 2022.
- Key suppliers : ISO 9001, 14001, 45001 certified

Zeology certifications and Life Cycle Analyses (LCA)

- First Zeology LCA data is available (Spin360)
- Zeology is ZDHC MRSL Conformance® – Level 3 certified
- Zeology is Cradle to Cradle Material Health® – Platinum certified
- Zeology is ToxFMD Screened Chemistry® certified
 - Required for e.g.; H&M, Levi Strauss & Co., Nike Inc., C&A

Rank	Element	% of Earth's Crust
1	Oxygen (O)	46.1%
2	Silicon (Si)	28.2%
3	Aluminum (Al)	8.2%
4	Iron (Fe)	5.6%
5	Calcium (Ca)	4.1%
6	Sodium (Na)	2.3%
7	Magnesium (Mg)	2.3%
8	Potassium (K)	2.0%
9	Titanium (Ti)	0.5%
10	Hydrogen (H)	0.1%
	Other elements	0.5%
Total		100.0%

Zeology Leather Tanning

It is **zeolite-based** and therefore chrome-free, heavy metal-free, and aldehyde-free.
Mineral tanning

Advantages

- Alternative to both chrome & GDA
- Chrome/GDA like leather haptics
- Compostable intermediate leather
- Chrome free shavings for fertilizer
- No risk of chrome VI formation
- Light coloured and white leather articles
- After tanning odor neutral
- Fully commercialized / good adoption by tanneries
- Leather allowed to be recycled

Disadvantages

- Not renewable (but abundantly available) Zeology has a mineral origin
- Requires more re-tannage than chrome tanning
- Higher cost than chrome or GDA leather (lower compared to vegetable or olive leaf tanning)
- Not metal free

ZDHC MRSL Conformance Level 3

ZEOLOGY | P919RQ49

Leather | Tanning and Retanning Agents | Mineral tanning agents

Other Name: MZ 8132



LEVEL 3: CHEMICAL
SUPPLIER SITE VISIT

Your ZDHC ChemCheck™ report confirms that your product has been verified to the above ZDHC Conformance Standard.

Product Description

Sustainable Zeolite tanning

Inventory Product Conformance



Level 1 – Passed a third-party review of documentation or an analytical test report where the data meet the QA and QC requirements in the MRSL Conformance Guidance to be accepted as evidence of conformance.



Level 2 – All requirements for Level 1 passed and passed a review of the product stewardship practices of the chemical supplier by the third-party certifier.



Level 3 – All requirements for Level 2 passed and passed a site visit to the chemical formulator to evaluate their product stewardship first-hand.

[Tell me more about MRSL conformance](#)

Cradle to Cradle Material Health Certificate - Platinum

Zeology has received the
**C2C Certified Material
Health Certificate™**
at the Platinum level

The circular choice for your
leather goods.



CRADLE TO CRADLE
PRODUCTS
INNOVATION
INSTITUTE

Material
Health

PLATINUM

Zeology

ISSUED TO Smit & Zoon B.V.

STANDARD 3.1

EXPIRES 19 December 2023

LEAD ASSESSMENT BODY
EPEA GmbH - Part of Drees & Sommer

PHASES AND PROCESSES CONSIDERED IN THE CHEMICAL TOXICITY ASSESSMENT
Manufacturing, professional use; Intended end of use: release to the environment; Unintended end of use: landfilling, Incineration

PRODUCTS COVERED
This product was assessed exclusively for use by professional tanneries trained in the proper handling and use of protective equipment for products which cause skin and eye irritation. The requirements for certification have only been met under these conditions.

PRODUCT OPTIMIZATION SUMMARY

- ✓ Cradle to Cradle Certified® Banned List compliant
- ✓ Material Health optimization strategy not required
- ✓ No exposure from carcinogens, mutagens, or reproductive toxicants
- ✓ VOC emissions testing not required for this product type
- ✓ Product is fully optimized - does not contain any GREY or x-assessed chemicals
- ✓ Process chemicals have been identified and none are GREY or x-assessed

PERCENTAGE OF CHEMICAL SUBSTANCES ASSESSED BY WEIGHT	ASSESSMENT RATINGS BY WEIGHT	PRODUCT OPTIMIZATION
100%	 a or b: 80.0-85.25% c: 35.1-34.75%	 a or b: 2 c: 3 x: 0 GREY: 0
Inventory threshold for chemicals in each material = 100 ppm	x: 0% GREY: 0% % CHEMICAL SUBSTANCES	5 CHEMICAL SUBSTANCES

MHCS232

ToxFMD Screened Chemistry Certified

Zeology is
ToxFMD Screened
Chemistry® Certified

The eco-friendly choice



TOX FMD SCREENED CHEMISTRY®

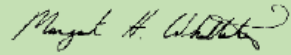
ROADMAP TO **ZERO**
ZDHC MRSL
Level 1 Conformance

ToxServices hereby grants use of the Licensed Mark identified above to:

Smit Tanning B.V.'s Zeology

This Certificate confirms that the following product has met ToxFMD Screened Chemistry® Program requirements, including establishing ZDHC MRSL Level 1 Conformance (v. 2.0):

CLIENT Smit Tanning B.V.	CERTIFICATE# 643
FORMULATION Zeology	FMD# 822
ToxFMD® VERSION 3.0	ISSUE DATE December 2, 2021
ToxFMD SCREENED CHEMISTRY® SCORE 33.8	EXPIRY DATE December 2, 2024


Margaret H. Whittaker, Ph.D., M.P.H., C.Biol., F.R.S.B., E.R.T., D.A.B.T.
ToxServices LLC

To verify status of certificate, please visit www.toxservices.com to access certificate registry.



Winner - Green Product Award '22 in the category Best of New Materials



Since 2013, the Green Product Award distinguishes products and services, good in sustainability, innovation & design. It is aimed at products & services on the market from start-ups and established companies who wish to highlight their sustainable achievements.

Creators of visionary concepts - not on the market yet - head to the Green Concept Award.

The Green Product Award raises awareness & visibility through its own channels (7 million online contacts) and additionally with the media and trade fair partners in Germany.

Outstanding participants have a chance to become a Member of the Green Future Club to enhance their network.

Zeology adoption



RE:SUEDE iconic sneaker by PUMA

Nera is proud to be part of PUMA's journey towards circularity with these biodegradable sneakers made from Zeology suede.



Coat and leather trousers by Mart Visser

The leather used for these fashion items is white supple lambskin leather is tanned with Zeology by Spanish tannery Riba Guixà.



Return to Nature bag collection by Anya Hindmarch

The tote and bucket bag styles are crafted from Zeology leather and can biodegrade naturally back to earth.



The first chrome free sneaker in the US by Italic

Italic, a direct-to-consumer e-commerce marketplace in the USA, has launched a pilot program of Zeology tanned leather **minimalistic white sneakers**. The Zeology sneakers are offered in three styles. With these sneakers Italic is presenting the very first chrome free tanned leather sneakers in the US market.



Black fashion bag in collaboration with Sityo

In a special collaboration with SITOY Group we have created a small black high-end fashion bag, made of Zeology leather.

Scandinavian hides are turned into unique biodegradable designer bags in London

Scan-Hide has teamed up with British designer Anya Hindmarch, and they have together started making biodegradable leather. In four years, all leather from the factory located in the south of the Danish island of Funen can be biodegradable.



Tasman Leathers of New Zealand

746volgers

2 w • 5

+ Volgen ...

A tanning agent that provides both sustainability benefits and superior leather performance — **Royal Smit & Zoon** Zeology is designed to deliver.

Zeology is zeolite-based and therefore chrome-free, heavy metal-free and aldehyde-free. It's the ultimate sustainable alternative to existing tanning agents, and Tasman is proud to support a product that aligns with what we believe in.



Scan-Hide A/S

529volgers

1 w • Bewerkt • 5

+ Volgen ...

This is the future... 🌱

Zeology is a revolutionary tanning agent providing green benefits without compromising the leathers superior performance. It surpasses all characteristics including, grain tightness, physical leather properties, lightfastness, and heat-resistance. In addition, its bright white color enables white leather and lighter and brighter colors than ever before.



Sustainable safety shoes by EMMA Safety Footwear

The use of Zeology leather significantly reduces the environmental impact of the production of the EMMA shoes.

Compostable Leather & Biodegradability



Dr. Ir. Wouter Hendriksen - R&D Manager Nera & Zeologist

Compostability Sustainability at end of life

- Making compostable leather starts with the end-of-life in mind and then reverse engineer/design.
- Biodegradability needs to be considered at all stages in the chain of production and during the life cycle of leather
- Biodegradability is a
 - material property, i.e., plastics, packaging, textile, leather, building materials.
 - complex matter of end-of-life scenarios, testing methods and terminologies.
 - the testing of substrate, substances and materials under environmental conditions.

We focus on biodegradation under controlled conditions (industrial composting).

Testing for compostability is time consuming (3 to 6 months)



Main benefits

Zeology is the truly sustainable alternative to existing leather tanning agents. Chrome-free, heavy metal-free and aldehyde-free.



Zeology is chrome-free, heavy metal-free and aldehyde-free.



Zeology based leather is full and tight and covers all luxury colors.



A step forward in the production of biodegradable leather [1].



Zeology based leather production has improved waste and effluent (water) management.

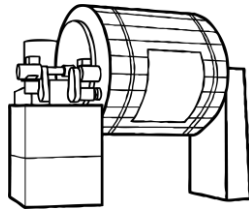


Zeology has a certified chemical health [1].

[1] Leather result depends on the other chemicals used.

Secondary benefits

Zeology is the truly sustainable alternative to existing leather tanning agents. Chrome-free, heavy metal-free and aldehyde-free.



Zeology has reached a high level of development and knowledge for relative swift implementation.



Zeology tannage requires no capital investment.



Zeology delivers good leather properties and thus allowing high quality physical properties for the designer to work with [1].



Zeology is used for cow, bull, yak, sheep, goat, buffalo, deer and several other sources

[1] Leather result depends on the other chemicals used.

Questions?



Summary

- Consumers respect and aspire to acquire (real) leather articles.
- Leather has a genuine, unique, handcrafted, and sustainable story.
- It supports the Wellbeing of Humans.
- Longevity, compared to alternative materials.
- The cattle stock will grow, thus the by-product leather is always at hand.
- The better the life of the animal the better the leather quality.
- Different tanning technologies offer a suitable range for all types of leather and possible product applications, combining natural character with durability.
- The leather industry is working hand-in-hand with the meat industry to live and secure the topics of animal welfare, traceability, and sustainability.
- Design to re-use, then re-use, then re-sell
- Royal Smit & Zoon is prepared for the future to offer new leather chemicals to fulfill the market's demand for the best possible sustainability actively reducing their use of fossil raw materials.



Thank you for your attention!

Let`s talk!



SMIT & ZOON