

Dr.-Ing. Jan Retzlaff
as public appointed and sworn in expert by
the Chamber of Industry and Commerce of Erfurt
for construction textiles and geosynthetics



Client number 725111
Project number 173601

expert's statement

Verification of the environmental innocuousness geotextile TenCate Geolon PP 60

Ordered on: 04 September 2017

Auftrag von: TenCate Geosynthetics Netherlands B. V.
Hoge Dijkje 2
7442 AE Nijverdal
The Netherlands

Erstellt am: 05 October 2017

Erstellt von: Dr.-Ing. Jan Retzlaff
c/o GEOscope GmbH & Co. KG
Nordstr. 3
99427 Weimar
Germany

Tel.: +49 (0) 3643 251 9857
Email: j.retzlaff@geoscope.eu

This report contains 7 text pages including an enclosure.

General Partner:
GEOscope Verwaltungs GmbH
Nordstr. 3, 99427 Weimar
AG Jena, HRB 510362
Managing Director:
Dr.-Ing. Jan Retzlaff

GEOscope GmbH & Co. KG
AG Jena, HRA 503457
Bank account:
Kreissparkasse Steinfurt
IBAN: DE56 4035 1060 0072 7616 53
SWIFT/BIC: WELADED1STF
VAT-ID: DE265 207 913

Dr.-Ing. Jan Retzlaff
public appointed and sworn in by the Chamber of
Industry and Commerce of Erfurt as an expert
for construction textiles and geosynthetics



attested and approved expert of the Federal Railway
Authority of Germany for geosynthetics (21/16/205)

0 Content

- 1 Order
- 2 Basic information
- 3 Background
- 4 Geosynthetics
- 5 Laboratory testing
- 6 Results
- 7 Evaluation

2 Order

On 2017-09-04 I have been asked by TenCate Geosynthetics Netherlands B. V. to assess the environmental innocuousness of the geotextile TenCate Geolon PP 60

3 Basic information

A product sample and further product information have been provided by the employer. Furthermore up to date standards and references have been used for the development of this statement.

[FGSV-535] FGSV (Hrsg.): Merkblatt über die Anwendung von Geokunststoffen im Erdbau des Straßenbaus. M Geok E. Köln: FGSV, 2016

[DGGT-2005] DGGT (Hrsg.): Empfehlungen zu Dichtungssystemen im Tunnelbau. EAG-EDT Empfehlungen des Arbeitskreises AK 5.1 „Kunststoffe in der Geotechnik und im Wasserbau“ der DGGT. Essen: VGE, 2005

[BBodSchVO-2009] BMJ: Bundes-bodenschutz- und Altlastenverordnung (BBodSchVO). www.juris.de. Stand: 31.07.2009

3 Background

Following general assumptions, polymeric raw materials are not water-soluble and hence do not affect soil or groundwater. There are water-soluble, flushing or edulcorating additives like stabilisers, auxiliary materials or pigments. These substances are in particular the reason of the demand of the verification of environmental innocuousness following M Geok E [FGSV-2005] and EAG-EDT [DGGT-2005]. This verification can be given via ingredients and declaration of environmental innocuousness on the safety data sheet for the corresponding product or via a chemical analysis. Both sources mentioned above are describing a procedure for this purpose. The procedure is referring to methods for the preparation of samples and the analysis mentioned in attachment 1 of BBodSchVO [BBodSchVO-2009]. Unless the test values assessing the effect of soil on groundwater following § 8 para. 1 clause 2 No. 1 under point 3.1 of attachment 2 of [BBodSchVO-2009] are not undercut, the geosynthetic is graded as environmental innocuous if the global parameter TOC in the 5. eluate does not exceed the critical value of 20 mg/l.

According to point 7.6 para. 3 M Geok E the product can still be graded as environmental innocuous, if a small exceedance of the critical values in the fifth eluate is coming along with a significant decrease of the TOC concentration from the first to the fifth eluate.

4 Geosynthetics

Representative tested was a geosynthetics of TenCate Geolon PP 60
This is a geotextile

Samples arrived on 2017-09-07

5 Laboratory testing

The preparation of the samples, the eluates and the chemical analysis of these has been carried out following the analysis mentioned in attachment 1 by a from DAP following DIN EN ISO/IEC 17025:2005 with DAP-PL-3067.00 accredited laboratory for environmental analysis. The laboratory is for the test procedures as listed in enclosure 1 of this report.

6 Results

The critical values shown in the following tables are relevant concerning to the assessment of environmental innocuousness.

Tabelle 1: Results for inorganic substances

Inorganic substances	Critical value [µg/l]	Measurement [µg/l]	Result [-]
antimony	10	< 5	o.k.
arsenic	10	< 5	o.k.
lead	25	< 5	o.k.
cadmium	5	< 0,5	o.k.
chromium, total	50	< 5	o.k.
chromate	8	< 5	o.k.
cobalt	50	< 5	o.k.
copper	50	< 5	o.k.
molybdenum	50	< 5	o.k.
nickel	50	< 5	o.k.
mercury	1	< 0,2	o.k.
selenium	10	< 5	o.k.
zinc	500	11	o.k.
tin	40	< 5	o.k.
cyanide, total	50	< 5	o.k.
cyanide, easily purgeable	10	< 5	o.k.
fluoride	750	< 10	o.k.

Tabelle 2: Results for organic substances

Organic substances	Critical value [µg/l]	Measurement [µg/l]	Result [-]
petroleum derived hydrocarbon	200	< 50	o.k.
arenes	20	< 5	o.k.
benzene	1	< 1	o.k.
volatile halog. hydrocarbon	10	< 8	o.k.
aldrine	0,1	< 0,005	o.k.
DDT	0,1	< 0,03	o.k.
phenole	20	< 10	o.k.
PCB, total	0,05	< 0,03	o.k.
PAH, total	0,2	0,071	o.k.
naphtalene	2	0,21	o.k.

Another criterion is the development of the total TOC from the first eluate to the fifth eluate. The critical value for the total TOC in the fifth eluate is 20 mg/l and shouldn't be exceeded.

Tabelle 3: Results for the development of TOC

Development of TOC	Critical value [µg/l]	Measurement [µg/l]	Result [-]
1 st eluate		2,1	
3 rd eluate		0,44	
5 th eluate	20	0,24	o.k.

The following figure shows the development of the TOC concentration from the first to the fifth eluate:

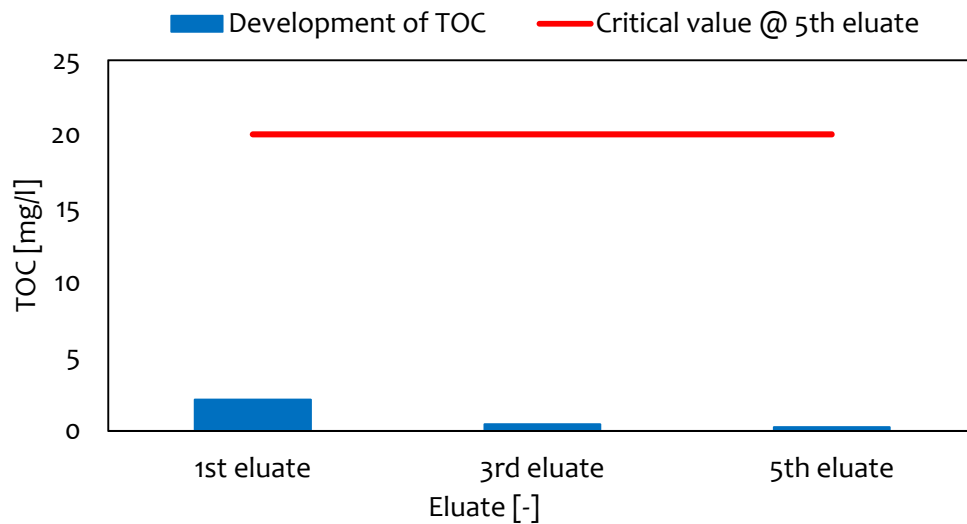


Figure 1: Development of TOC

7 Evaluation

The verification of every single value has shown that the representative tested product can be graded as environmentally innocuous following M Geok E. This evaluation is valid for all members of the product family.

Dr.-Ing. Jan Retzlaff

Applied test procedures:

Substances	Detection limit	Standard
antimony	< 5 µg/l	DIN EN ISO 11885
arsenic	< 5 µg/l	DIN EN ISO 11885
lead	< 5 µg/l	DIN EN ISO 11885
cadmium	< 0,5 µg/l	DIN EN ISO 11885
chromium, total	< 5 µg/l	DIN EN ISO 11885
chromate	< 5 µg/l	DIN 38405 - D24
cobalt	< 5 µg/l	DIN EN ISO 11885
copper	< 5 µg/l	DIN EN ISO 11885
molybdenum	< 5 µg/l	DIN EN ISO 11885
nickel	< 5 µg/l	DIN EN ISO 11885
mercury	< 0,2 µg/l	DIN EN 1483 - E12
selenium	< 5 µg/l	DIN EN ISO 11885
zinc	< 5 µg/l	DIN EN ISO 11885
tin	< 5 µg/l	DIN EN ISO 11885
cyanide, total	< 5 µg/l	DIN 38405 - D13
cyanide, easily purgeable	< 5 µg/l	DIN EN ISO 14403 - 1
fluoride	< 10 µg/l	DIN EN ISO 10304 - 1 - D20
petroleum derived hydrocarbon	< 50 µg/l	DIN EN ISO 9377 (GC/FID)
arenes	< 5 µg/l	ISO 11423 - 1
benzene	< 1 µg/l	ISO 11423 - 1
volatile halog. hydrocarbon	< 8 µg/l	DIN EN ISO 10301 - F4
aldrine	< 0,005 µg/l	DIN 38414 - S20
DDT	< 0,03 µg/l	DIN 38414 - S20
phenole	< 10 µg/l	DIN 38409 - H16
PCB, total	< 0,03 µg/l	DIN 38414 - S20
PAH, total	< 0,005 µg/l	DIN ISO 28540
naphtalene	< 0,005 µg/l	DIN ISO 28540
TOC	< 0,1 mg/l	DIN EN 1484 - H3