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TESTING OF LIGHT WEIGHT AGGREGATES (LWA) MATERIALS

Tore Krogstad & Petter D. Jenssen

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DEPARTMENT OF SOIL AND WATER SCIENCES

Agricultural University of Norway

P.O.Box 5028, N-1432 Aas Tel: +47-64 94 75 00 - Agriuniv. Ås
Fax: +47-64 94 82 11 Archive of reports: +47-64 94 82 04

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Summary:

LWA materials in the size fractions 0.8-1.6 mm and 2-4 mm from 8 European countries (Portugal, Denmark, Estonia, Sweden, Finland, Spain, Germany, Norway) were analysed for Mohr hardness, sink velocity, specific surface, acid loss, pH, P sorption capacity, chemical composition and hydraulic conductivity using the procedure described in the manual "Test methods for Filtralite". Product specifications for each country are enclosed.

Key words:

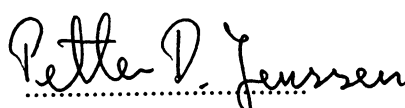
1. LWA
2. Chemical and physical composition
3. P sorption capacity
4. Heavy metals

Project manager:

Administration:



Tore Krogstad
Professor (IJVF)



Petter D. Jenssen
Professor (ITF)



Trond Børresen
Head of department/Professor

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TESTING OF LIGHT WEIGHT AGGREGATES (LWA) MATERIALS

1. Introduction

Chemical and physical characterization is carried out on different LWA materials from 8 European countries. The analysis are performed at the Department of Soil and Water Sciences and at the Department of Agricultural Engineering, Agricultural University of Norway, during the summer and the autumn 1999.

2. Material and methods.

LWA in the size fractions of 0.8-1.6 mm and 2-4 mm are analysed according the following scheme. The letters R and C in the size fraction descriptions represent spherical and crushed material respectively. The material is dried at room temperature prior to analysis.

Country of production	Reg. no.	Size fraction in mm	Mohr hardness	Sedimentation velocity	Specific surface	Acid loss	pH	P sorption capacity	Chemical composition	Hydraulic conductivity
Portugal	99-006	0.8-1.6		x	x	x		x		x*
Portugal	99-006	0.8-1.6 C		x	x	x		x		x
Portugal	99-006	2-4 R	x	x	x	x	x	x	x	x
Denmark	99-080	0.8-1.6		x	x	x		x		x
Denmark	99-080	2-4 R	x	x	x	x	x	x	x	x
Estonia	99-23	0.8-1.6 R		x	x	x		x		x
Estonia	99-23	2-4 R	x	x	x	x	x	x	x	x*
Sweden	99-007	0.8-1.6 C		x	x	x		x		x
Sweden	99-007	2-4 R	x	x	x	x	x	x	x	x
Finland	99-008	0.8-1.6 R		x	x	x		x		x
Finland	99-008	2-4 R	x	x	x	x	x	x	x	x*
Spain	99-102	2-4 R	x	x	x	x	x	x	x	*
Germany	99-130	2-4 R	x	x	x	x	x	x	x	x
Germany	99-132	0.8-1.6 C		x	x	x		x		x
Norway	Filtralite NC	0.8-1.6		x	x	x		x		x*
Norway	Filtralite NR	2-4	x	x	x	x	x	x	x	x

* To small sample volume to analyse hydraulic conductivity.

The analysis is performed according the manual "Test methods for Filtralite" with the following exceptions and modifications.

Sedimentation velocity:

For some sample types most of the particles are floating in water. But for samples with sinking particles a sample volume was selected to be sure that the calculation of sedimentation velocity at least is based on the results of 20 particles. The amount of floating particles are reported in percent of the whole sample.

Specific surface:

Because of restrictions in sample volumes and the variability of the methods the results are reported with a detections limit of 0.3 m²/g material.

P sorption capacity:

Phosphorus sorption capacity is measured according to the method 15.2 “Measuring P adsorption in batch experiments using a solution with one high P concentration”.

Chemical composition:

Silver (Ag) and mercury (Hg) are digested in nitric acid and measured using EAAS and CVAAS respectively. Selenium (Se) is digested in nitric acid and hydrochloric acid and measured using HAAS. All other elements are digested in Aqua regia and measured using ICP-AES.

3. Results.

The results are presented in 3 tables. In the comments the country of production and the particle size are used as description of the material.

Table 1. The results of Mohr hardness, pH, specific surface, P sorption capacity, acid loss and hydraulic conductivity (the standard deviation is given in brackets).

Country of production	Reg. no.	Size fraction in mm	Mohr hardness	pH	Specific surface, m ² /g	P sorption capacity, mg P/kg	Acid loss %	Hydraulic conductivity m/dg
Portugal	99-006	0.8-1.6			1,6	2340	7,2	
Portugal	99-006	0.8-1.6 C			4,4	2570	8,3	1264 (221)
Portugal	99-006	2-4 R	3	9,3	0,7	440	3,3	2460 (414)
Denmark	99-080	0.8-1.6			<0,3	1640	6,1	977 (184)
Denmark	99-080	2-4 R	3	9,8	<0,3	950	3,7	1985 (171)
Estonia	99-23	0.8-1.6 R			<0,3	180	1,4	599 (42)
Estonia	99-23	2-4 R	5	9,7	<0,3	290	1,2	
Sweden	99-007	0.8-1.6 C			<0,3	270	1,2	227 (2)
Sweden	99-007	2-4 R	3	8,1	<0,3	80	0,6	968 (-)
Finland	99-008	0.8-1.6 R			<0,3	90	0,8	1178 (36)
Finland	99-008	2-4 R	2	7,7	<0,3	80	0	
Spain	99-102	2-4 R	2	10,4	0,3	3800	2,6	
Germany	99-132	0.8-1.6 C			<0,3	1090	1,2	697 (126)
Germany	99-130	2-4 R	4	8,2	<0,3	1000	0	2265 (88)
Norway	Filtralite NC	0.8-1.6 C			<0,3	<50	2,5	
Norway	Filtralite NR	2-4 R	2	10,1	<0,3	750	3,5	2230 (220)

Mohr hardness:

Finland, Spain and Norway are clearly the most easy samples to scratch. The materials seem very brittle and easy to crush. Estonia has the maximum hardness. Mohr hardness for all the samples vary in the interval of 2 to 5.

pH:

All materials have a pH higher than 7 and vary from 7.7 (Finland) to 10.4 (Spain).

Specific surface:

The method measure principally outer specific surface. Spain has the highest specific surface of all materials with the highest value in the size fraction of 0.8-1.6 C (4.4 m²/g). The other countries have values of 0.3 or lower.

P sorption capacity:

The P sorption capacity vary over a large interval from <50 (Norway Filtralite NC) to 3800 mg P/kg (Spain). Portugal, Denmark, Spain and Germany have a P sorption capacity higher than 1000 mg P/kg. Samples from other countries have substantially lower P sorption capacity. The P sorption capacity is dependent on the content of calcium, aluminium and iron as well as the specific surface area.

Table 2. The results of sedimentation velocity.

Country of production	Size fraction	cm/sec			Country of production	Size fraction	cm/sec				
		24 h	1 month	Boiling 5 h			24 h	1 month	Boiling 5 h		
Portugal	0.8-1.6	Avg.	3,83	6,06	4,14	Finland	0.8-1.6	Avg.	2,17	3,99	4,67
		Std.	1,76	1,87	1,17			RStd.	0,57	2,25	1,54
		% flouting	15	0	40			% flouting	85	0	40
Portugal	0.8-1.6	Avg.	3,52	5,97	5,47	Finland	2-4 R	Avg.	0	0	0
		CStd.	1,48	2,45	1,76			Std.	0	0	0
		% flouting	20	0	30			% flouting	100	100	100
Portugal	2-4 R	Avg.	0	5,72	7,34	Spain	2-4 R	Avg.	0	9,43	13,08
		Std.	0	2,74	2,84			Std.	0	4,06	3,27
		% flouting	100	30	40			% flouting	100	52	0
Denmark	0.8-1.6	Avg.	2,48	5,54	4,31	Germany	0.8-1.6	Avg.	2,44	2,89	3,14
		Std.	1,48	2,8	1,75			CStd.	0,63	0,6	0,48
		% flouting	55	0	60			% flouting	0	0	0
Denmark	2-4 R	Avg.	0	6,66	7,8	Germany	2-4 R	Avg.	7,63	10,8	12,4
		Std.	0	3,66	3,75			Std.	2,54	2,38	2,3
		% flouting	100	25	35			% flouting	0	0	0
Estonia	0.8-1.6	Avg.	4,41	5,91	6,95	Norway	0.8-1.6	Avg.	4,49	4,81	4,99
		RStd.	2,21	1,79	1,42			CStd.	1,62	0,71	1
		% flouting	10	0	45			% flouting	0	0	0
Estonia	2-4 R	Avg.	5,5	7,74	7,71	Norway	2-4 R	Avg.	0	4,61	5,18
		Std.	3,77	4,19	2,24			Std.	0	1,65	2,01
		% flouting	50	34	5			% flouting	100	87	73
Sweden	0.8-1.6	Avg.	3,31	5	3,86						
		CStd.	1,99	1,36	2,26						
		% flouting	45	0	45						
Sweden	2-4 R	Avg.	0	4,68	7,45						
		Std.	0	4,81	6,24						
		% flouting	100	75	65						

Acid loss:

Acid loss vary in the interval of 0 (Germany) to 8.3% (Portugal) and it has normally a maximum in the smallest grain size fraction (0.8-1.6 mm).

Hydraulic conductivity:

Hydraulic conductivity vary from 227 (Sweden 0.8-1.6C) to 2460 m/day (portugal 2-4R). A high standard deviation for most of the material show a large variability and may indicate that LWA is an inhomogeneous product with regard to hydraulic conductivity.

Sedimentation velocity:

Sedimentation velocity is measured in three different ways; 1) after wetting for 24 h, 2) after wetting for 1 month, 3) after boiling for 5 hours. Boiling is supposed to give maximum water absorption to LWA, but for some materials 1 month of wetting gave higher values. For most of the samples the difference is not significant because of a high standard deviation in the measurements. Many countries have a very heterogenous material with a mixture of sinking and floating particles. Average values for the sinking particles and the fraction of floating particles are given.

It is a large difference between the countries. The results vary from Finland (2-4R) where the particles are floating for all treatments to Spain (2-4R) with a sedimentation velocity of 13.08 cm/sec after boiling for 5 hours.

Table 3. Chemical composition of the fraction 2-4 mm.

Element		Portugal 99-006	Denmark 99-080	Estonia 99-23	Sweden 99-007	Finland 99-008	Spain 99-102	Germany 99-130	Norway Filtralite NR
Aluminium (Al)	mg/kg	16900	31600	7900	5030	6130	18000	3670	8940
Antimony (Sb)	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0	<1,0
Arsenic (As)	mg/kg	6,3	4,8	0,75	1,3	1,2	37	<5	1,2
Barium (Ba)	mg/kg	87,1	191	25	23,9	23,6	89,4	30,1	57,7
Lead (Pb)	mg/kg	<4	4,7	<4	<4	<4	8,2	<4	<4
Iron (Fe)	mg/kg	16900	26300	8990	9580	17000	12800	11600	9680
Cadmium (Cd)	mg/kg	<0,4	<0,4	<0,4	<0,4	<0,4	<0,4	<0,4	<0,4
Potassium (K)	mg/kg	2760	3310	1180	988	1110	4040	657	1937
Calcium (Ca)	mg/kg	14700	27900	6890	4020	1590	26300	2190	6930
Chromium (Cr)	mg/kg	282	67,7	8,9	7,9	16,8	12,5	8	11,3
Mercury (Hg)	mg/kg	<0,015	<0,015	<0,015	<0,015	<0,015	0,055	<0,015	0,076
Magnesium (Mg)	mg/kg	4750	6870	3020	2120	4490	15800	1850	6510
Sodium (Na)	mg/kg	932	2470	502	840	1170	860	406	1439
Nickel (Ni)	mg/kg	173	79	9,3	12,2	24,1	11,4	13,5	21,6
Selenium (Se)	mg/kg	0,12	0,17	0,01	0,01	0,034	0,036	0,14	0,016
Silver (Ag)	mg/kg	0,075	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05

Chemical composition:

The chemical composition of the material reflect most likely the composition of the soil from which the LWA is produced. It is large differences between countries with respect to both macro nutrients and heavy metals. For natural environments the content of heavy metals are of vital importance. Portugal and Spain have contents of chromium and nickel, and arsenic and lead respectively which far exceed the contents in the samples from other countries. Filtralite from Norway has a higher content of mercury compared to the other countries, but the value in itself is low.

4. Filtralite compare to LWA from other countries:

The composition of Filtralite (Norway) compare to other LWA products produced abroad:

Mohr hardness	Low
pH:	High
Specific surface:	Low, but at the same level as the majority
P sorption capacity:	Low to medium
Acid loss:	Medium
Hydraulic conductivity:	Medium to high
Sedimentation velocity:	The fraction 0.8-1.6 mm, medium to high with a very low percent floating particles. The fraction 2-4 mm, low with a high percent floating particles.
Chemical composition:	Low and medium content for most of the elements. High content of sodium and mercury.

Appendix.

Product specification of LWA 1999.

- Portugal
- Denmark
- Estonia
- Sweden
- Finland
- Spain
- Germany
- Norway

Product specification of LWA 1999 PORTUGAL

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6	-	-	1,6	2340	7,2	
0.8 - 1.6 C	-	-	4,4	2570	8,3	1264 (221) ²
2 - 4 R	3	9,3	0,7	440	3,3	2460 (414) ²

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	3,83	6,06	4,14
0.8 - 1.6	Std. (cm/sec)	1,76	1,87	1,17
	Floating particles (%)	15	0	40
	Avg. (cm/sec)	3,52	5,97	5,47
0.8 - 1.6 C	Std. (cm/sec)	1,48	2,45	1,76
	Floating particles (%)	20	0	30
	Avg. (cm/sec)	0	5,72	7,34
2 - 4 R	Std. (cm/sec)	0	2,74	2,84
	Floating particles (%)	100	30	40

³ Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
16900	<1,0	6,3	87,1	<4	16900	<0,4	2760	14700	282	<0,015	4750	932	173	0,12	0,075

⁴Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.
Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 DENMARK

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6	-	-	<0,3	1640	6,1	977 (184) ²
2 - 4 R	3	9,8	<0,3	950	3,7	1985 (171) ²

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	2,48	5,54	4,31
0.8 - 1.6	Std. (cm/sec)	1,48	2,8	1,75
	Floating particles (%)	55	0	60
	Avg. (cm/sec)	0	6,66	7,8
2 - 4 R	Std. (cm/sec)	0	3,66	3,75
	Floating particles (%)	100	25	35

³ Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
31600	<1,0	4,8	191	4,7	26300	<0,4	3310	27900	67,7	<0,015	6870	2470	79	0,17	<0,05

⁴ Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.
Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 ESTONIA

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6 R	-	-	<0,3	180	1,4	599 (42) ²
2 - 4 R	5	9,7	<0,3	290	1,2	

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	4,41	5,91	6,95
0.8 - 1.6 R	Std. (cm/sec)	2,21	1,79	1,42
	Floating particles (%)	10	0	45
	Avg. (cm/sec)	5,5	7,74	7,71
2 - 4 R	Std. (cm/sec)	3,77	4,19	2,24
	Floating particles (%)	50	34	5

³ Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
7900	<1,0	0,75	25	<4	8990	<0,4	1180	6890	8,9	<0,015	3020	502	9,3	0,01	<0,05

⁴ Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.

Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 SWEDEN

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6 C	-	-	<0,3	270	1,2	227 (2) ²
2 - 4 R	3	8,1	<0,3	80	0,6	968

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	3,31	5	3,86
0.8 - 1.6 C	Std. (cm/sec)	1,99	1,36	2,26
	Floating particles (%)	45	0	45
	Avg. (cm/sec)	0	4,68	7,45
2 - 4 R	Std. (cm/sec)	0	4,81	6,24
	Floating particles (%)	100	75	65

³ Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
5030	<1,0	1,3	23,9	<4	9580	<0,4	988	4020	7,9	<0,015	2120	840	12,2	0,01	<0,05

⁴ Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.
Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 FINLAND

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6 R	-	-	<0,3	90	0,8	1178 (36) ²
2 - 4 R	2	7,7	<0,3	80	0	

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	2,17	3,99	4,67
0.8 - 1.6 R	Std. (cm/sec)	0,57	2,25	1,54
	Floating particles (%)	85	0	40
	Avg. (cm/sec)	0	0	0
2 - 4 R	Std. (cm/sec)	0	0	0
	Floating particles (%)	100	100	100

³Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
6130	<1,0	1,2	23,6	<4	17000	<0,4	1110	1590	16,8	<0,015	4490	1170	24,1	0,034	<0,05

⁴Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.
Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 SPAIN

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
2 - 4 R	2	10,4	0,3	3800	2,6	

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

Sedimentation velocity: ²

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	0	9,43	13,08
2 - 4 R	Std. (cm/sec)	0	4,06	3,27
	Floating particles (%)	100	52	0

² Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ³

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
18000	<1,0	37	89,4	8,2	12800	<0,4	4040	26300	12,5	0,055	15800	860	11,4	0,036	<0,05

³ Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.
Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 GERMANY

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6 C	-	-	<0,3	1090	1,2	697 (126) ²
2 - 4 R	4	8,2	<0,3	1000	0	2265 (88) ²

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	2,44	2,89	3,14
0.8 - 1.6 C	Std. (cm/sec)	0,63	0,6	0,48
	Floating particles (%)	0	0	0
	Avg. (cm/sec)	7,63	10,8	12,4
2 - 4 R	Std. (cm/sec)	2,54	2,38	2,3
	Floating particles (%)	0	0	0

³ Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
3670	<1,0	<5	30,1	<4	11600	<0,4	657	2190	8	<0,015	1850	406	13,5	0,14	<0,05

⁴ Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.

Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.

Product specification of LWA 1999 NORWAY

The tests are performed according to the methods described in "Test methods for Filtralite".
Comments to the method used are described in footnotes.

Particle size (mm)	Mohr hardness	pH	Specific surface (m ² /g)	P sorption capacity (mg P/kg) ¹	Acid loss (%)	Hydraulic conductivity (m/day)
0.8 - 1.6	-	-	<0,3	<50	2,5	
2 - 4	2	10,1	<0,3	750	3,5	2230 (220) ²

¹ According to method 15.2 "Measuring P sorption capacity in batch experiment using a high P concentration solution".

² Standard deviation.

Sedimentation velocity: ³

Particle size (mm)		1 day	1 month	Boiling 5 h
	Avg. (cm/sec)	4,49	4,81	4,99
0.8 - 1.6	Std. (cm/sec)	1,62	0,71	1
	Floating particles (%)	0	0	0
	Avg. (cm/sec)	0	4,61	5,18
2 - 4	Std. (cm/sec)	0	1,65	2,01
	Floating particles (%)	100	87	73

³ Average sedimentation velocity and standard deviation only include sedimentating particles.

Chemical composition in mg/kg of the particle size fraction 2 - 4 mm: ⁴

Al	Sb	As	Ba	Pb	Fe	Cd	K	Ca	Cr	Hg	Mg	Na	Ni	Se	Ag
8940	<1,0	1,2	57,7	<4	9680	<0,4	1937	6930	11,3	0,076	6510	1439	21,6	0,016	<0,05

⁴ Ag and Hg are digested using HNO₃ and measured using EAAS and CVAAS respectively.
Se is digested using HNO₃ and HCl in combination and measured using HAAS. All other elements are digested using aqua regia and measured using ICP-AES.