

DONGGUAN JUYOU PAPER PLASTIC PRODUCT CO., LTD  
 #27 GAOLONG WEST ROAD, GAOBU TOWN, DONGGUAN CITY, China

The following sample(s) was/were submitted and identified on behalf of the client as:

Sample Description : One sample of PE Cling film (biodegradable) in transparent.

Buyer : ECOPLASTICS TECHNOLOGY LIMITED  
 Brand : JUYOU  
 Sample Color : Transparent  
 Composition : PE  
 End Use : Food packaging  
 Manufacturer : Dongguan Juyou Paper and Plastic Products Co.,Ltd.  
 Country of Origin : China  
 Country of Destination : Europe, United States, Austria

Sample Receiving Date : 1<sup>st</sup> July 28, 2021  
 : 2<sup>nd</sup> Aug 10, 2021  
 Testing Period : Aug 10, 2021 - Jan 31 2022

Test Result(s) : Unless otherwise stated the results shown in this test report refer only to the sample(s) tested, for further details, please refer to the following page(s).

Test Performed : Selected test(s) as requested by applicant

Conclusions :	<b>Test Requested</b>	<b>Result</b>
	<b>ASTM D5511-18 Determining Anaerobic Biodegradation of Plastic Materials Under High-Solids Anaerobic-Digestion Conditions</b>	<b>See Result</b>

Signed for and on behalf of  
 SGS (Hong Kong) Limited



Chan Kai Kong, Alfred, Assistant Technical Manager

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

**Test Summary:**

This test method consists of selection and analysis of material for testing, obtaining a concentrated anaerobic inoculum from an anaerobic laboratory-scale digester, exposing the material to an anaerobic-static-batch fermentation at more than 20 % solids, measuring total carbon in the gas (CO<sub>2</sub> and CH<sub>4</sub>) evolved as a function of time, and assessing the degree of biodegradability.

The percentage of biodegradability is obtained by determining the percent of conversion of carbon from the test material to carbon in the gaseous phase (CH<sub>4</sub> and CO<sub>2</sub>). This percentage of biodegradability will not include the amount of carbon from the test substance that is converted to cell biomass and that is not, in turn, metabolized to CO<sub>2</sub> and CH<sub>4</sub>.

**Test Results (#):**

**A. Characteristics of the Inoculum:**

Compost used: Sludge from Organic Compost – Bernalillo Municipal Compost Facility & Albuquerque Mu-nicipal Wastewater Facility

Storage time: Fifteen day

Storage conditions and treatments: Hold period observed @ 53 ± 2°C

Inoculum Characteristics:	
pH of suspension	7.5 - 7.8
Volatile Fatty Acids (VFA)	0.9 g/kg
NH <sub>4</sub> <sup>+</sup> -N	1.1 mg/kg
Total dry solids content	47.3% w/w

Note:

1. % w/w = Percent weight per weight

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

**B. Test parameters for Test material and Reference material (Control item)**

Test material description: PE Cling film (biodegradable) in transparent

Test item	Test material	Reference material
Total Organic Carbon (TOC)	855 mg C /g	420 mg C /g
Theoretical amount of Carbon Dioxide (ThCO <sub>2</sub> )	3135 mg CO <sub>2</sub> /g	1540 mg CO <sub>2</sub> /g
Theoretical amount of Methane (ThCH <sub>4</sub> )	1140 mg CH <sub>4</sub> /g	560 mg CH <sub>4</sub> /g
Theoretical volume of biogas	1596 mL / g	784 mL / g

Note:

1. mg C/g: milligram of Carbon per gram
2. mg CO<sub>2</sub>/g : milligram of Carbon Dioxide per gram
3. mg CH<sub>4</sub>/g : milligram of Methane per gram
4. Test was performed in triplicate. Average result is reported.
5. Theoretical amount of carbon dioxide (ThCO<sub>2</sub>) in mg CO<sub>2</sub>/g is determined by Equation (1):

$$\text{ThCO}_2 = \text{TOC} \times \frac{44}{12} \quad (1)$$

Where ThCO<sub>2</sub> is the maximum theoretical amount of carbon dioxide evolved after completely oxidizing a chemical compound, calculated from the molecular formula and expressed as milligrams of carbon dioxide evolved per gram (mg CO<sub>2</sub>/g).

44 and 12 are the molecular mass of carbon dioxide and the atomic mass of carbon, respectively.

6. Theoretical amount of methane (ThCH<sub>4</sub>) in mg CH<sub>4</sub>/g is determined by Equation (2):

$$\text{ThCH}_4 = \text{TOC} \times \frac{16}{12} \quad (2)$$

Where ThCO<sub>2</sub> is the maximum theoretical amount of carbon dioxide evolved after completely oxidizing a chemical compound, calculated from the molecular formula and expressed as milligrams of carbon dioxide evolved per gram (mg CH<sub>4</sub>/g).

16 and 12 are the molecular mass of carbon dioxide and the atomic mass of carbon, respectively.

7. Each mmole (12 mg) of organic carbon from the test sample can be converted into 1 mmole of gaseous CH<sub>4</sub> or CO<sub>2</sub>, or both. One mmole of gas produced occupies 22.4 mL at standard temperature and pressure (STP).

C. Biodegradation data

Time (Date)	Blank		Test material (Mean of 3 trials)			Reference material (Mean of 3 trials)		
	Net CO <sub>2</sub> cumulative (mL)	Net CH <sub>4</sub> cumulative (mL)	Net CO <sub>2</sub> cumulative (mL)	Net CH <sub>4</sub> cumulative (mL)	Degradation (%)	Net CO <sub>2</sub> cumulative (mL)	Net CH <sub>4</sub> cumulative (mL)	Degradation (%)
4-Nov-21	74.5	10.2	130.2	26.4	0.2	422.6	37.3	4.8
5-Nov-21	89.5	12.4	215.7	44.8	0.5	680.5	60.3	8.1
6-Nov-21	107.7	15.0	314.1	64.2	0.8	1111.3	96.9	13.8
9-Nov-21	125.5	26.8	377.3	78.2	0.9	1391.6	353.8	20.3
10-Nov-21	140.7	36.6	423.3	116.2	1.1	1668.7	606.8	26.8
11-Nov-21	162.2	50.5	484.4	165.7	1.4	1904.6	814.6	32.0
12-Nov-21	182.3	63.4	558.0	225.0	1.7	2147.6	1044.4	37.6
15-Nov-21	202.2	76.5	601.6	260.3	1.8	2356.8	1242.9	42.4
16-Nov-21	223.0	90.0	638.8	290.8	1.9	2586.9	1457.0	47.6
17-Nov-21	245.2	106.8	682.6	331.3	2.1	2781.2	1637.8	51.9
18-Nov-21	264.7	121.4	762.5	401.5	2.4	2956.2	1804.2	55.8
21-Nov-21	286.2	137.6	832.0	462.7	2.7	3140.2	1978.9	59.9
22-Nov-21	307.7	153.8	906.7	531.0	3.1	3316.1	2141.6	63.7
23-Nov-21	330.7	171.2	981.1	599.1	3.4	3433.1	2247.2	66.1
24-Nov-21	352.2	187.5	1055.2	666.9	3.7	3540.7	2347.8	68.2
27-Nov-21	373.7	203.8	1104.7	711.2	3.9	3684.0	2475.6	71.2
28-Nov-21	389.7	229.9	1154.3	755.4	4.0	3793.9	2659.6	74.4
29-Nov-21	403.0	251.9	1203.4	800.7	4.2	3884.1	2807.8	77.0
30-Nov-21	416.4	274.0	1235.3	829.3	4.3	3996.4	2996.5	80.4
3-Dec-21	430.7	297.8	1262.2	853.6	4.3	4146.3	3247.3	85.0
4-Dec-21	445.6	322.5	1284.6	879.5	4.4	4225.0	3383.9	87.3
5-Dec-21	461.6	348.8	1304.9	903.3	4.4	4234.6	3397.0	87.0
6-Dec-21	475.4	371.8	1326.2	928.0	4.4	4267.3	3452.6	87.7
9-Dec-21	480.7	380.4	1346.9	954.4	4.5	4272.6	3461.6	87.7
10-Dec-21	484.9	387.4	1367.8	981.1	4.6	4277.4	3469.7	87.7
11-Dec-21	490.3	396.1	1394.6	1007.5	4.7	4283.3	3479.8	87.7
12-Dec-21	494.0	402.1	1423.6	1035.9	4.9	4288.1	3487.9	87.8
15-Dec-21	498.2	408.9	1452.5	1064.4	5.0	4291.8	3494.3	87.7
16-Dec-21	501.9	415.0	1480.2	1091.6	5.2	4296.6	3502.5	87.8
17-Dec-21	506.8	423.0	1512.0	1115.8	5.3	4300.9	3509.8	87.8
18-Dec-21	511.0	429.9	1541.8	1138.3	5.4	4305.8	3518.0	87.8
21-Dec-21	515.8	437.6	1573.0	1178.3	5.6	4310.6	3526.3	87.8
22-Dec-21	521.1	446.4	1605.0	1219.1	5.8	4315.9	3535.3	87.8
23-Dec-21	526.4	455.2	1637.5	1260.7	6.0	4320.7	3543.5	87.8
24-Dec-21	530.7	462.2	1670.7	1303.1	6.2	4326.0	3552.5	87.8
27-Dec-21	536.0	470.9	1701.2	1342.2	6.4	4329.8	3558.8	87.8
28-Dec-21	540.3	477.9	1735.1	1385.5	6.6	4335.2	3568.0	87.8
29-Dec-21	544.1	484.1	1766.3	1425.4	6.8	4339.0	3574.3	87.8
30-Dec-21	549.4	492.8	1798.9	1467.1	7.0	4343.8	3582.6	87.8
2-Jan-22	555.8	503.3	1831.4	1508.7	7.1	4349.1	3591.6	87.8
3-Jan-22	560.6	511.1	1855.6	1539.5	7.3	4354.4	3600.8	87.8
4-Jan-22	565.9	519.9	1883.9	1575.6	7.4	4359.8	3609.8	87.8
7-Jan-22	570.7	527.8	1910.1	1608.9	7.6	4363.5	3616.2	87.8
8-Jan-22	576.5	537.4	1926.6	1630.0	7.7	4368.3	3624.4	87.7
9-Jan-22	580.3	543.6	1970.0	1685.4	7.9	4372.7	3631.7	87.8

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

12-Jan-22	584.5	550.6	2003.2	1727.8	8.1	4375.9	3637.1	87.7
13-Jan-22	588.7	557.5	2038.5	1772.9	8.3	4380.7	3645.2	87.8
14-Jan-22	594.6	567.2	2072.5	1816.3	8.5	4385.0	3652.4	87.7
15-Jan-22	598.9	574.2	2105.2	1857.9	8.7	4390.3	3661.5	87.7
16-Jan-22	604.1	582.9	2139.1	1901.3	8.9	4395.1	3669.7	87.7
17-Jan-22	608.9	590.7	2171.7	1942.9	9.1	4400.4	3678.8	87.7
18-Jan-22	613.2	597.7	2205.7	1986.4	9.3	4406.8	3689.7	87.8
19-Jan-22	619.0	607.3	2238.2	2028.0	9.5	4412.7	3699.6	87.8
20-Jan-22	623.8	615.2	2272.8	2072.2	9.7	4417.5	3707.8	87.8
21-Jan-22	629.7	624.7	2299.2	2115.6	9.9	4423.4	3717.7	87.8
22-Jan-22	632.9	629.9	2325.4	2158.9	10.1	4428.7	3726.9	87.9

Note:

- 1.Test was performed in triplicate. Average result is reported.
- 2.Calculation of the percentage biodegradation

From the cumulative amounts of Carbon Dioxide (CO<sub>2</sub>) and Methane (CH<sub>4</sub>) released, calculate the degree of biodegradation (%) of a sample for each measurement using Equation (3):

$$\% \text{ Degradation} = \frac{\text{mL Biogas produced, net} - \text{mL Blank}}{\text{mL Biogas, theoretically}} \times 100\% \quad (3)$$

where

"mL Biogas, theoretically" is calculated according to Section B.

**D. Composition of biogas at the end of incubation (day 80)**

Treatment	Carbon Dioxide (CO <sub>2</sub> )	Methane (CH <sub>4</sub> )
Blank	41.4 %	41.2 %
Test Material	43.0 %	39.9 %
Reference Material	43.8 %	36.9 %

**E. Conclusion**

Degree of biodegradation of Reference material is 87.9% after 80 days of the test

Degree of biodegradation of test material is 10.1% after 80 days of the test

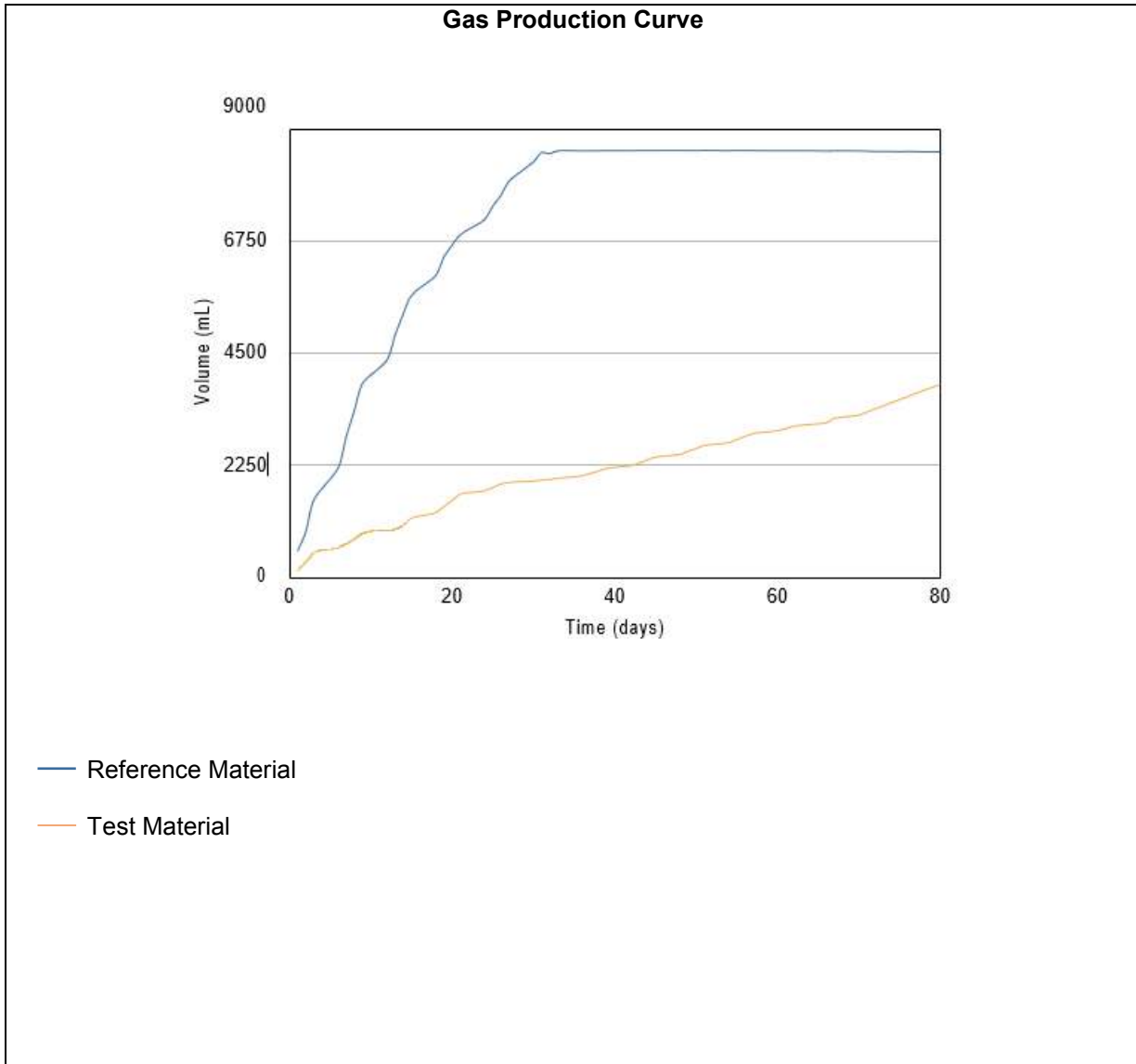
**(#) The marked test results were obtained from a SGS assessed competent subcontract laboratory**

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

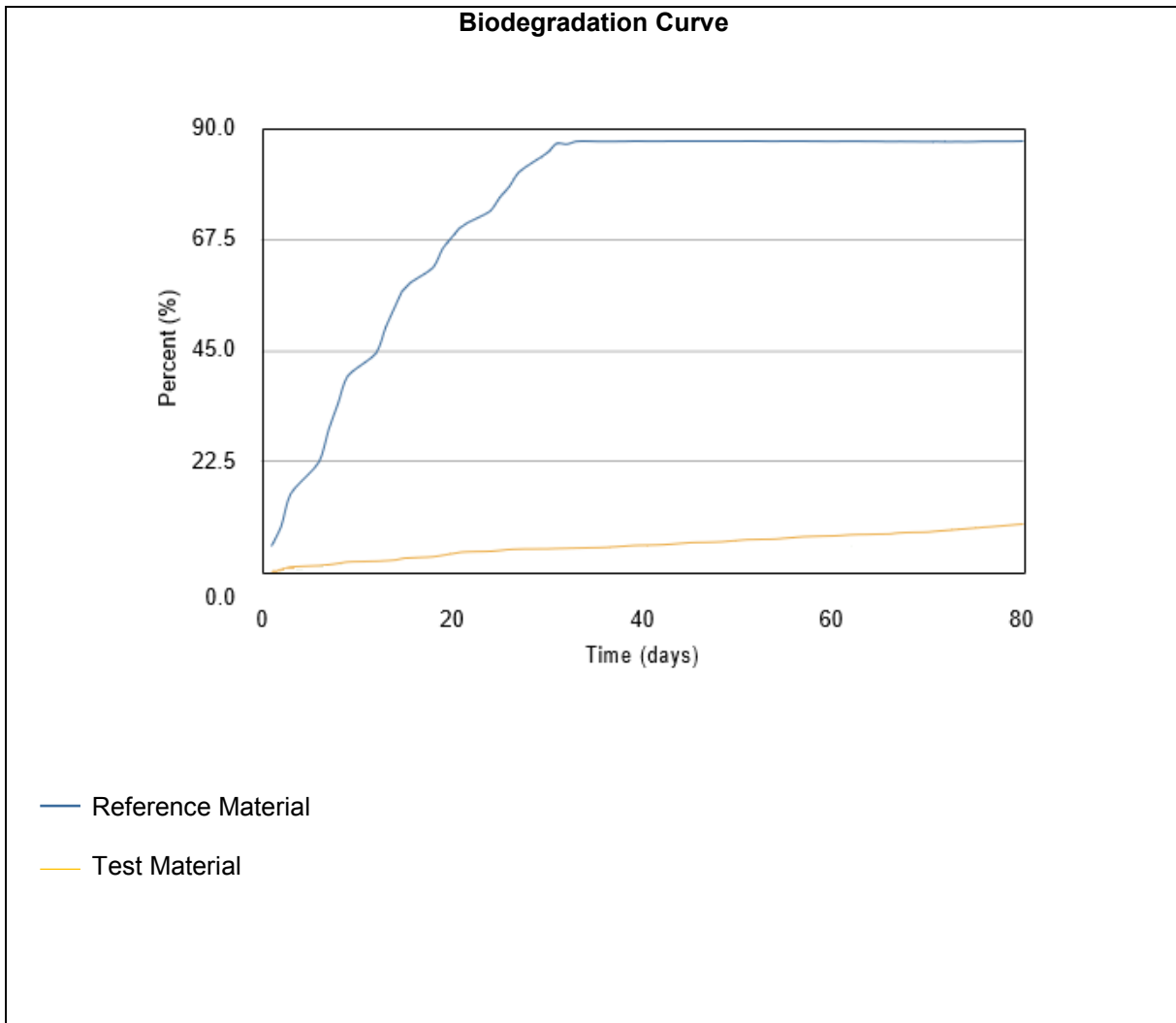


Appendix



This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

**Sample Photo**



\*\*\*End of Report\*\*\*

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Documents.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.