

Test Report

GZF20-003741-01

Date: 15 Sep 2020

Client Name: WenZhou Jin Yu Plastic Products Co.,Ltd  
Client Address: LuoShan Avenue, Luofeng Industrial Park, Tangxia Town, Ruian, Wenzhou, Zhejiang, China  
Sample Name: T-15521 CA Pellets  
Manufacturer: /  
Sample Batch No.: /  
Production Date: /

Above information and sample(s) was/were submitted and certified by the client, SGS quoted the information with no responsibility as to the accuracy, adequacy and/or completeness.

SGS Reference No.: CP20-008961/KYM200015R  
Date of Sample Received: 19 Mar 2020  
Testing Period: 19 Mar 2020 - 15 Sep 2020  
Test Requested: Selected test(s) as requested by client.  
Test Method: Please refer to next page(s).  
Test Result(s): Please refer to next page(s).

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SGS Authorized Signature

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Sample Description:

Specimen No.	SGS Sample ID	Description
1	GZF20-003741.001	Sample in bag

**Test Result(s):**

1 Summary

The purpose of this test was to determine the ultimate aerobic biodegradability of test item (T-15521 CA Pellets) under controlled composting conditions. In a 2 liters testing system, test item was used as a source of nutrients and the test mixture is aerated with carbon dioxide free air under controlled rate. The percentage biodegradation was determined by measuring evolved carbon dioxide. Under the present conditions of this study, with a 150-day period of testing, the average percentage biodegradation of reference item (Thin-layer Chromatograph grade Cellulose) was 91.8% while percentage biodegradation of test item was 55.8%.

During the first 10 days of testing, the compost inoculum produced 86.5 mg CO<sub>2</sub> per gram of volatile solids, within the range of 50 to 150 mg CO<sub>2</sub> per gram of volatile solids, the first ten days of testing is therefore considered to be valid. The percentage biodegradation of reference item Thin-layer Chromatograph grade Cellulose was 73.7% after 45th days of testing, greater than 70%, the testing is therefore considered to be valid.

2 Introduction

2.1 Study Title

Determination of the Ultimate Aerobic Biodegradability of T-15521 CA Pellets under Controlled Composting Conditions.\*

2.2 Objective

To determine the ultimate aerobic biodegradability of test item under controlled composting conditions.

2.3 Principle

The test method determines the ultimate biodegradability and degree of disintegration of test item under conditions simulating an intensive aerobic composting process. The inoculum used consists of stabilized, mature compost derived, if possible, from composting the organic fraction of solid municipal waste.

The test item is mixed with the inoculum and introduced into a static composting vessel where it is intensively composted under optimum oxygen, temperature and moisture conditions for a test period not exceeding 6 months.

During the aerobic biodegradation of the test item, carbon dioxide, water, mineral salts and new microbial cellular constituents (biomass) are the ultimate biodegradation products. The carbon dioxide produced is continuously monitored, or measured at regular intervals, in test and blank vessels to determine the cumulative carbon dioxide production. The percentage biodegradation is given by the ratio of the carbon dioxide produced from the test item to the maximum theoretical amount of carbon dioxide that can be produced from the test item. The maximum theoretical amount of carbon dioxide produced is calculated from the measured total organic carbon (TOC) content. The percentage



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biodegradation does not include that amount of carbon converted to new cell biomass which is not metabolized in turn to carbon dioxide during the course of the test.

### 3 Reagents and Apparatus

#### 3.1 Test item

Sample number: KM200015-01

#### 3.2 Reference item

Identity: TLC (thin-layer chromatography) grade cellulose microcrystalline

Reference number: R20001

Batch number: 20190719

Source: Sinopharm Chemical Reagent Co.,Ltd

Molecular formula:  $(C_6H_{10}O_5)_n$

Molecular Weight:  $(162.14)_n$

CAS No.: 9004-34-6

Physical Characters: White crystalline powder

Purity: TLC (thin-layer chromatography) grade

Storage conditions: Room temperature, keep dry

#### 3.3 Inoculum

Name: Aerobic Compost

Source: Self-control.

Age of the compost: 3 months

Treatment prior to use: The coarse particles and inert matters were removed, and then sieved on a screen of 0.5cm.

#### 3.4 Test Conditions

The test was conducted at  $58^{\circ}\text{C}\pm 2^{\circ}\text{C}$ , weak light, and under steam conditions. There were no conditions that would interfere the growth of microbes.

#### 3.5 Apparatus

- (1) Reaction equipment;
- (2) Pressurized-Air System;
- (3) Gas absorption device;
- (4) Gas rotameter;
- (5) Device for increasing humidity of carbon dioxide free air;
- (6) Device for preparing carbon dioxide free air;
- (7) Portable intelligent gas detection and alarming device;
- (8) Thermostat water bath cauldron

### 4 Preparation Prior to Test

#### 4.1 Preparation of test containers

Test containers were selected, thoroughly cleaned and well prepared.

#### 4.2 Preparation of the inoculum

After coarse particles were removed and the compost was sieved, the parameters such as pH, moisture content, total dry solids, volatile solids, total nitrogen and total organic carbon were measured for compost quality control. The results were listed below: pH 7.48, moisture content 48.1%, total dry solids 51.9%, volatile solids 44.1% (of dry solid), total nitrogen 1.38% and total

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organic carbon 21.92%. Adding water to adjust the amounts of the total dry solids to the content of the wet solids is 50.4% before the compost is used.

4.3 Absorption bottles

There were 3 absorption bottles (each containing 400mL of 20g/L sodium hydroxide solution) connected in series with a reaction vessel.

4.4 Number of reaction vessels

- a) Three vessels for the test item (mat-1, mat-2, mat-3);
- b) Three vessels for the positive reference item (pos-1, pos-2, pos-3);
- c) Three vessels for the blank (com-1, com-2, com-3).

4.5 Preparation of test item

The parameter such as total organic carbon and moisture content were measured for test item. The results were listed as below, total organic carbon 49.48% and moisture content 2.4%. The ratio of the dry mass of the inoculum to the dry mass of the test material shall be about 6:1. Total 360g inoculum (dry mass) and 60g test item (dry mass) were added in the reaction vessel for testing.

4.6 Preparation of reference item

Total organic carbon and moisture content were also measured for reference item and the total organic carbon was determined as 42.82%, moisture content was 4.2%.

5 Test Method

(1) The test was conducted at 58°C±2°C, with bubbling CO<sub>2</sub>-free, water-saturated air through the test mixture at a rate of 0.05 L/min.

(2) The oxygen concentration in reaction vessel was measured twice daily in the first week of testing. Afterwards, the measurement frequency can be reduced. Adjust air flow as needed. Measure the amount of carbon dioxide absorption once a day during the first 45 days, and about twice per week after 45 days.

(3) CO<sub>2</sub> determination (Sodium hydroxide absorption method):

CO<sub>2</sub> was collected by an absorption bottle (containing sodium hydroxide solution) which was connected with a backflow preventer in the reaction vessel. When the absorption bottle with CO<sub>2</sub> was taken away, the next absorption (containing sodium hydroxide solution) in the series was connected with the backflow preventer while a new absorption bottle (containing sodium hydroxide solution) was added in the series. The absorption bottle with CO<sub>2</sub> was titrated with HCl standard solution.

(4) The air tightness of the test device was checked every day.

(5) The composting vessels were shaken and mixed well once weekly. Mixture pH was determined and the parameters such as smell of the exhaust air, humidity of the compost, color, fungal development, structure change and disintegration of the test item were determined. Pictures of test item before test, and after 150-day of testing were shown in Figure 6-10, respectively.

(6) Calculation of the theoretical amount of carbon dioxide

Calculate the theoretical amount of carbon dioxide ThCO<sub>2</sub>, in grams per vessel, which can be produced by the test material using Equation (1):

$$ThCO_2 = M_{TOT} \times C_{TOT} \times 44/12 \quad (1)$$

where

M<sub>TOT</sub> is the total dry solids, in grams, in the test material introduced into the composting vessels at the start of the test;

C<sub>TOT</sub> is the proportion of total organic carbon in the total dry solids in the test material, in grams



per gram;

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

(7) Calculation of the percentage biodegradation

From the cumulative amounts of carbon dioxide released, calculate the percentage biodegradation  $D_t$  of the test material for each measurement interval using Equation (2):

$$D_t = ((CO_2)_T - (CO_2)_B) / ThCO_2 \times 100 \quad (2)$$

where

$(CO_2)_T$  is the cumulative amount of carbon dioxide evolved in each composting vessel containing test material, in grams per vessel;

$(CO_2)_B$  is the mean cumulative amount of carbon dioxide evolved in the blank vessels, in grams per vessel;

$ThCO_2$  is the theoretical amount of carbon dioxide which can be produced by the test material, in grams per vessel.

If the differences between the individual results are less than 20 %, calculate the average percentage biodegradation. If this is not the case, use the values for each composting vessel separately.

Use the same equation to calculate the degree of biodegradation of the reference material.

#### 6 Criteria of Results Justification

6.1 The degree of biodegradation of the reference item is more than 70% after 45 days of testing.

6.2 Prepare the curves of cumulative amount of carbon dioxide production against time and the curves of percentage biodegradation against time for the test item and reference item respectively.

6.3 The inoculum in the blank has produced more than 50 mg but less than 150 mg of carbon dioxide per gram of volatile solids (mean values) after 10 days of testing.



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7 Results

7.1 Calculation of the theoretical amount of carbon dioxide (ThCO<sub>2</sub>)

Table 1. Calculation of the theoretical amount of carbon dioxide (ThCO<sub>2</sub>)

Reaction vessels	Inoculum			Reference item (Thin-layer Chromatograph grade Cellulose)			KM200001-01			
	No.	1	2	3	4	5	6	7	8	9
Wet solids of inoculum, g	693.64	693.64	693.65	693.69	693.65	693.64	693.69	693.75	693.62	
Total dry solids of inoculum, g	359.8	359.8	359.8	359.8	359.8	359.8	359.8	359.8	359.8	359.8
Wet solids of reference item or test item, g	/	/	/	62.66	62.62	62.63	61.48	61.49	61.48	
M <sub>TOT</sub> , g	/	/	/	60.0	60.0	60.0	60.0	60.0	60.0	60.0
TOC,%		21.92			42.82			49.48		
C <sub>TOT</sub> , g/g		0.2192			0.4282			0.4948		
ThCO <sub>2</sub> , g/vessel	/	/	/	94.2	94.2	94.2	108.9	108.9	108.9	

Note: ThCO<sub>2</sub>=M<sub>TOT</sub> × C<sub>TOT</sub> × 44/12 (See section 5)

7.2 Cumulative CO<sub>2</sub> production and percentage biodegradation during the test period (Table 2)



Table 2. Cumulative CO<sub>2</sub> production and percentage biodegradation during the test

Date	Time ( Day )	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>Cp</sub>	average	(CO <sub>2</sub> ) <sub>M</sub>	average	D <sub>p</sub> %	average	D <sub>M</sub> %	average
20200328	1	1.77	2.17	2.17	1.83	1.81	0.4	0.4	0.0	0.0
			2.24		1.72		0.5		0.0	
			2.11		1.88		0.4		0.1	
20200329	2	3.54	4.77	4.73	4.11	4.23	1.3	1.3	0.5	0.6
			4.80		4.26		1.3		0.7	
			4.63		4.32		1.2		0.7	
20200330	3	4.76	7.81	7.48	6.25	6.08	3.2	2.9	1.4	1.2
			7.48		6.00		2.9		1.1	
			7.13		5.99		2.5		1.1	
20200331	4	5.33	10.74	10.36	8.87	8.16	5.7	5.3	3.3	2.6
			10.56		7.86		5.6		2.3	
			9.78		7.74		4.7		2.2	
20200401	5	6.45	12.88	12.85	11.15	10.62	6.8	6.8	4.3	3.8
			13.15		10.44		7.1		3.7	
			12.53		10.27		6.5		3.5	
20200402	6	8.07	15.31	16.16	13.87	13.10	7.7	8.6	5.3	4.6
			16.96		12.82		9.4		4.4	
			16.20		12.61		8.6		4.2	
20200403	7	9.13	17.84	18.81	15.36	14.73	9.2	10.3	5.7	5.1
			19.93		14.60		11.5		5.0	
			18.66		14.24		10.1		4.7	
20200404	8	10.75	21.19	22.19	17.03	16.26	11.1	12.2	5.8	5.1
			23.53		16.22		13.6		5.0	
			21.85		15.53		11.8		4.4	
20200405	9	12.32	25.03	26.17	19.04	18.19	13.5	14.7	6.2	5.4
			27.62		18.18		16.2		5.4	
			25.88		17.34		14.4		4.6	
20200406	10	13.72	28.37	29.73	20.79	20.00	15.5	17.0	6.5	5.8
			31.79		20.10		19.2		5.9	
			29.02		19.11		16.2		5.0	
20200407	11	14.61	31.75	33.26	22.09	21.42	18.2	19.8	6.9	6.3
			35.28		21.56		22.0		6.4	
			32.75		20.61		19.3		5.5	
20200408	12	15.49	35.17	36.43	23.88	23.48	20.9	22.2	7.7	7.3
			38.66		23.85		24.6		7.7	
			35.45		22.71		21.2		6.6	



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Table 2. Cumulative CO<sub>2</sub> production and percentage degradation during the test (Cont'd)

Date	Time (Day)	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>Cp</sub>	average	(CO <sub>2</sub> ) <sub>M</sub>	average	D <sub>p</sub> %	average	D <sub>M</sub> %	average
20200409	13	16.58	38.97	40.28	25.82	25.86	23.8	25.2	8.5	8.5
			42.37		26.64		27.4		9.2	
			39.49		25.13		24.3		7.9	
20200410	14	17.83	43.05	43.97	27.55	27.69	26.8	27.8	8.9	9.1
			45.79		28.60		29.7		9.9	
			43.08		26.93		26.8		8.4	
20200411	15	18.70	46.19	47.10	29.97	29.99	29.2	30.1	10.4	10.4
			48.93		30.79		32.1		11.1	
			46.18		29.22		29.2		9.7	
20200412	16	20.04	49.39	50.08	31.95	31.95	31.1	31.9	10.9	10.9
			51.77		32.75		33.7		11.7	
			49.08		31.14		30.8		10.2	
20200413	17	21.32	52.57	53.26	33.70	33.66	33.2	33.9	11.4	11.3
			55.12		34.52		35.9		12.1	
			52.09		32.74		32.7		10.5	
20200414	18	22.49	55.80	56.40	35.02	35.20	35.4	36.0	11.5	11.7
			58.37		36.32		38.1		12.7	
			55.03		34.28		34.5		10.8	
20200415	19	23.60	60.06	60.50	36.44	36.59	38.7	39.2	11.8	11.9
			62.58		37.63		41.4		12.9	
			58.87		35.70		37.4		11.1	
20200416	20	24.62	62.84	63.62	37.90	37.73	40.6	41.4	12.2	12.0
			65.59		38.72		43.5		12.9	
			62.45		36.58		40.2		11.0	
20200417	21	25.58	65.86	66.57	39.15	39.01	42.8	43.5	12.5	12.3
			68.43		40.05		45.5		13.3	
			65.41		37.84		42.3		11.3	
20200418	22	26.45	70.13	70.74	40.48	40.48	46.4	47.0	12.9	12.9
			72.50		41.63		48.9		13.9	
			69.58		39.32		45.8		11.8	
20200419	23	27.49	74.71	75.30	42.44	42.52	50.1	50.8	13.7	13.8
			77.17		43.80		52.8		15.0	
			74.03		41.31		49.4		12.7	
20200420	24	28.51	78.76	79.11	44.32	44.89	53.3	53.7	14.5	15.0
			80.72		46.09		55.4		16.1	
			77.87		44.25		52.4		14.5	



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Table 2. Cumulative CO<sub>2</sub> production and percentage degradation during the test (Cont'd)

Date	Time (Day)	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>CP</sub>	average	(CO <sub>2</sub> ) <sub>M</sub>	average	D <sub>p</sub> %	average	D <sub>M</sub> %	average
20200421	25	29.84	82.24	82.52	45.56	46.40	55.6	55.9	14.4	15.2
			84.07		48.04		57.6		16.7	
			81.26		45.59		54.6		14.5	
20200422	26	31.24	86.11	86.34	47.50	48.22	58.2	58.5	14.9	15.6
			87.58		49.82		59.8		17.1	
			85.32		47.35		57.4		14.8	
20200423	27	32.18	89.01	89.08	49.42	50.10	60.3	60.4	15.8	16.5
			90.14		51.56		61.6		17.8	
			88.09		49.32		59.4		15.8	
20200424	28	33.44	91.73	91.75	51.21	52.11	61.9	61.9	16.3	17.2
			92.39		53.14		62.6		18.1	
			91.12		51.99		61.2		17.0	
20200425	29	34.57	93.49	93.55	52.79	54.25	62.5	62.6	16.7	18.1
			94.16		55.38		63.3		19.1	
			92.99		54.58		62.0		18.4	
20200426	30	35.78	95.27	95.26	54.35	55.97	63.1	63.1	17.1	18.5
			95.99		57.09		63.9		19.6	
			94.51		56.48		62.4		19.0	
20200427	31	36.97	97.12	97.00	55.71	57.81	63.8	63.7	17.2	19.1
			97.79		59.43		64.6		20.6	
			96.11		58.30		62.8		19.6	
20200428	32	38.23	98.98	98.63	57.39	59.58	64.5	64.1	17.6	19.6
			99.27		61.29		64.8		21.2	
			97.65		60.05		63.1		20.0	
20200429	33	39.52	100.92	100.33	59.17	61.36	65.2	64.6	18.1	20.1
			100.83		63.14		65.1		21.7	
			99.24		61.76		63.4		20.4	
20200430	34	40.68	102.84	102.24	60.67	62.99	66.0	65.4	18.4	20.5
			102.88		65.10		66.0		22.4	
			101.00		63.21		64.0		20.7	
20200501	35	41.84	104.95	104.28	62.96	65.00	67.0	66.3	19.4	21.3
			104.48		67.11		66.5		23.2	
			103.43		64.95		65.4		21.2	
20200502	36	42.64	107.14	106.21	63.83	66.15	68.4	67.5	19.5	21.6
			106.42		68.09		67.7		23.4	
			105.08		66.54		66.3		22.0	



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Table 2. Cumulative CO<sub>2</sub> production and percentage degradation during the test (Cont'd)

Date	Time (Day)	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>CP</sub>	average	(CO <sub>2</sub> ) <sub>M</sub>	average	D <sub>P</sub> %	average	D <sub>M</sub> %	average
20200503	37	43.59	108.81	107.90	65.24	67.61	69.2	68.3	19.9	22.1
			108.25		69.61		68.7		23.9	
			106.64		67.99		66.9		22.4	
20200504	38	44.46	111.13	109.67	66.76	69.19	70.7	69.2	20.5	22.7
			109.84		71.13		69.4		24.5	
			108.05		69.66		67.5		23.1	
20200505	39	45.51	113.23	111.59	68.34	70.71	71.9	70.1	21.0	23.1
			111.71		72.69		70.3		25.0	
			109.83		71.11		68.3		23.5	
20200506	40	46.28	114.53	112.99	69.14	71.71	72.4	70.8	21.0	23.4
			113.10		73.71		71.0		25.2	
			111.33		72.29		69.1		23.9	
20200507	41	47.08	116.20	114.81	70.31	72.88	73.4	71.9	21.3	23.7
			114.83		74.72		71.9		25.4	
			113.41		73.61		70.4		24.4	
20200508	42	48.22	117.69	116.41	71.78	74.28	73.7	72.4	21.6	23.9
			116.33		76.03		72.3		25.5	
			115.21		75.04		71.1		24.6	
20200509	43	49.24	119.17	117.83	73.11	75.48	74.2	72.8	21.9	24.1
			117.76		77.22		72.8		25.7	
			116.57		76.11		71.5		24.7	
20200510	44	50.24	120.42	119.23	74.63	76.94	74.5	73.2	22.4	24.5
			119.16		78.58		73.2		26.0	
			118.11		77.60		72.1		25.1	
20200511	45	51.17	121.53	120.57	76.31	78.62	74.7	73.7	23.1	25.2
			120.72		80.38		73.8		26.8	
			119.45		79.16		72.5		25.7	
20200515	49	53.94	125.37	124.23	79.67	82.11	75.8	74.6	23.6	25.9
			124.38		83.49		74.8		27.1	
			122.93		83.16		73.3		26.8	
20200519	53	56.69	128.45	127.53	83.06	85.05	76.2	75.2	24.2	26.1
			127.69		87.03		75.4		27.9	
			126.45		85.07		74.1		26.1	
20200522	56	58.94	131.48	130.61	85.54	87.76	77.0	76.1	24.4	26.5
			130.81		89.98		76.3		28.5	
			129.53		87.75		74.9		26.5	



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Table 2. Cumulative CO<sub>2</sub> production and percentage degradation during the test (Cont'd)

Date	Time (Day)	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>CP</sub> average	average	(CO <sub>2</sub> ) <sub>M</sub> average	D <sub>p</sub> %	average	D <sub>M</sub> %	average	
20200526	60	61.33	134.51	133.80	89.41	91.44	77.7	76.9	25.8	27.7
			134.36		93.76		77.5		29.8	
			132.53		91.14		75.6		27.4	
20200529	63	62.94	137.23	136.75	92.64	94.92	78.8	78.4	27.3	29.4
			138.00		97.42		79.7		31.7	
			135.03		94.72		76.5		29.2	
20200601	66	64.56	139.52	139.07	96.04	98.39	79.5	79.1	28.9	31.1
			139.91		100.93		80.0		33.4	
			137.78		98.20		77.7		30.9	
20200604	69	66.27	143.01	142.29	99.54	101.41	81.4	80.7	30.6	32.3
			143.05		103.79		81.5		34.5	
			140.79		100.89		79.1		31.8	
20200610	75	68.08	146.60	145.53	102.23	104.53	83.3	82.2	31.4	33.5
			146.00		106.98		82.7		35.7	
			144.00		104.39		80.6		33.4	
20200612	77	70.25	148.92	147.69	104.18	107.12	83.5	82.2	31.2	33.9
			148.23		109.57		82.8		36.1	
			145.92		107.60		80.3		34.3	
20200616	81	72.45	151.21	150.29	106.90	109.70	83.6	82.6	31.6	34.2
			151.05		112.09		83.5		36.4	
			148.62		110.12		80.9		34.6	
20200619	84	74.08	154.03	152.72	109.26	112.12	84.8	83.5	32.3	34.9
			153.48		114.59		84.3		37.2	
			150.66		112.51		81.3		35.3	
20200622	87	74.89	157.13	155.51	111.12	113.98	87.3	85.6	33.3	35.9
			155.84		116.38		86.0		38.1	
			153.57		114.45		83.5		36.3	
20200625	90	76.74	159.07	157.34	114.39	117.06	87.4	85.6	34.6	37.0
			157.39		119.26		85.6		39.0	
			155.55		117.53		83.7		37.5	
20200630	95	78.48	161.16	159.40	118.00	120.57	87.7	85.9	36.3	38.7
			159.27		122.68		85.8		40.6	
			157.77		121.03		84.2		39.1	
20200703	98	79.76	162.28	160.89	121.27	123.90	87.6	86.1	38.1	40.5
			160.72		126.61		86.0		43.0	
			159.66		123.82		84.8		41.8	



Table 2. Cumulative CO<sub>2</sub> production and percentage degradation during the test (Cont'd)

Date	Time ( Day )	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>CP</sub>	average	(CO <sub>2</sub> ) <sub>M</sub>	average	D <sub>p</sub> %	average	D <sub>M</sub> %	average
20200707	102	80.93	164.37	162.75	124.76	127.16	88.5	86.9	40.3	42.5
			162.02		130.26		86.1		45.3	
			161.85		126.45		85.9		41.8	
20200710	105	82.14	165.59	164.38	128.53	130.76	88.5	87.3	42.6	44.7
			163.29		133.94		86.2		47.6	
			164.25		129.83		87.2		43.8	
20200714	109	83.34	168.27	166.81	132.22	134.30	90.1	88.6	44.9	46.8
			165.71		137.39		87.5		49.6	
			166.44		133.28		88.2		45.9	
20200717	112	84.54	169.88	168.61	135.95	137.20	90.6	89.2	47.2	48.4
			167.51		140.09		88.1		51.0	
			168.44		135.57		89.1		46.9	
20200721	116	85.86	171.55	170.67	139.29	139.96	90.9	90.0	49.1	49.7
			169.57		142.09		88.9		51.6	
			170.90		138.49		90.3		48.3	
20200724	119	86.94	172.88	172.16	141.64	141.93	91.2	90.5	50.2	50.5
			171.06		143.85		89.3		52.3	
			172.55		140.29		90.9		49.0	
20200725	120	87.54	173.68	172.95	143.03	143.13	91.4	90.7	51.0	51.1
			171.81		144.97		89.5		52.7	
			173.36		141.40		91.1		49.5	
20200728	123	88.87	175.28	174.51	145.24	145.17	91.7	90.9	51.8	51.7
			173.37		146.99		89.7		53.4	
			174.89		143.27		91.3		50.0	
20200731	126	90.16	176.79	175.93	146.95	146.83	91.9	91.1	52.2	52.1
			174.78		148.55		89.9		53.6	
			176.23		144.99		91.4		50.4	
20200804	130	91.65	178.45	177.39	149.11	149.06	92.1	91.0	52.8	52.7
			176.28		150.86		89.9		54.4	
			177.45		147.19		91.1		51.0	
20200807	133	92.89	179.85	178.72	152.00	151.96	92.3	91.1	54.3	54.3
			177.74		153.60		90.1		55.8	
			178.55		150.28		91.0		52.7	
20200811	137	95.74	182.67	181.54	155.19	155.10	92.3	91.1	54.6	54.5
			180.54		156.70		90.0		56.0	
			181.40		153.42		91.0		53.0	



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Table 2. Cumulative CO<sub>2</sub> production and percentage degradation during the test (Cont'd)

Date	Time ( Day )	Cumulative CO <sub>2</sub> production (g/vessel)					Percentage biodegradation (%)			
		Blank average	Reference material		KM200015-01		Reference material		KM200015-01	
			(CO <sub>2</sub> ) <sub>CP</sub>	average	(CO <sub>2</sub> ) <sub>M</sub>	average	D <sub>p</sub> %	average	D <sub>M</sub> %	average
20200814	140	97.56	184.47	183.33	157.84	157.28	92.2	91.1	55.4	54.9
			182.39		158.63		90.1		56.1	
			183.13		155.38		90.9		53.1	
20200818	144	99.45	186.60	185.29	160.42	160.50	92.5	91.1	56.0	55.2
			184.29		160.67		90.1		56.2	
			184.99		157.47		90.8		53.3	
20200821	147	101.30	188.51	187.23	162.47	161.48	92.6	91.2	56.2	55.3
			186.22		162.57		90.2		56.3	
			186.96		159.40		90.9		53.4	
20200824	150	102.62	190.19	189.09	164.37	163.34	92.9	91.8	56.7	55.8
			188.11		164.35		90.8		56.7	
			188.98		161.31		91.7		53.9	

Note: If the result of the Percentage biodegradation is negative , counts as "0".



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7.3 The curves of cumulative carbon dioxide production against time for the reference item (Figure 1) and test item (Figure 2)

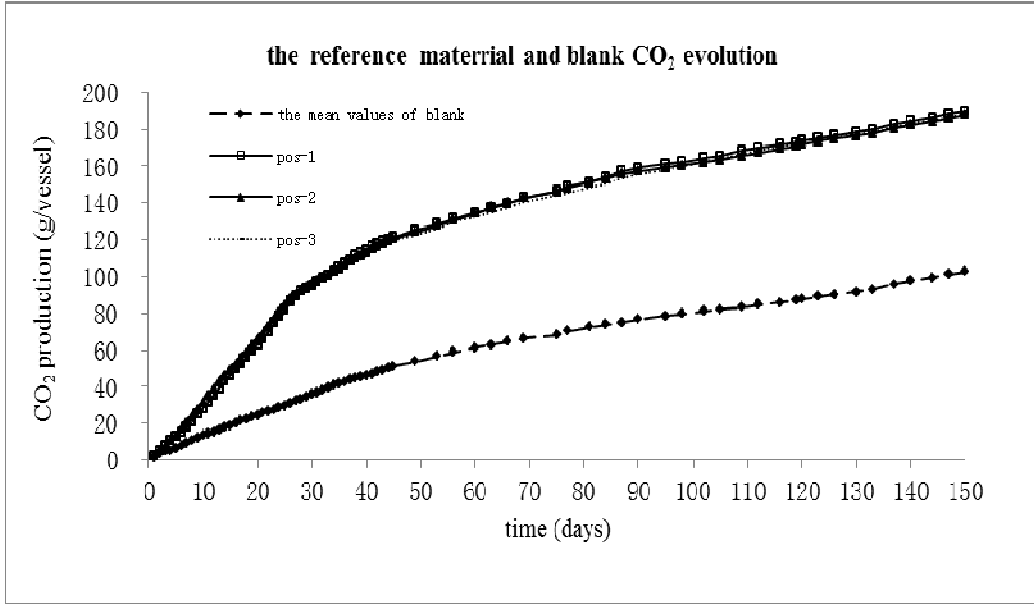


Fig. 1: Reference item and blank (150 days) CO<sub>2</sub>-evolution curve



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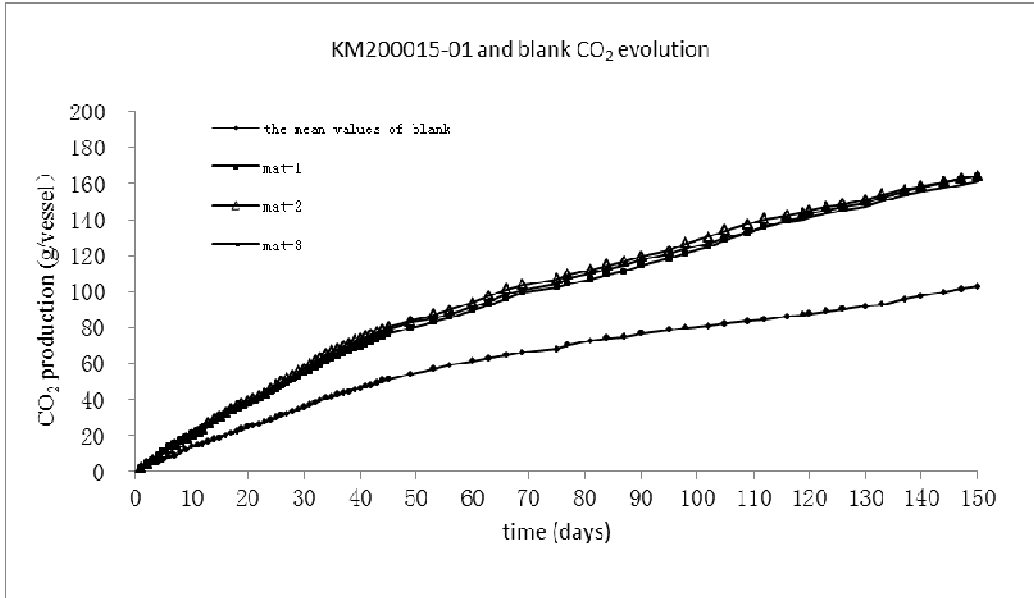


Fig. 1: KM200015-01 and blank (150 days) CO<sub>2</sub>-evolution curve



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7.3 The curves of percentage biodegradation against time for the reference item (Figure 3, Figure 5) and test item (Figure 4, Figure 5)

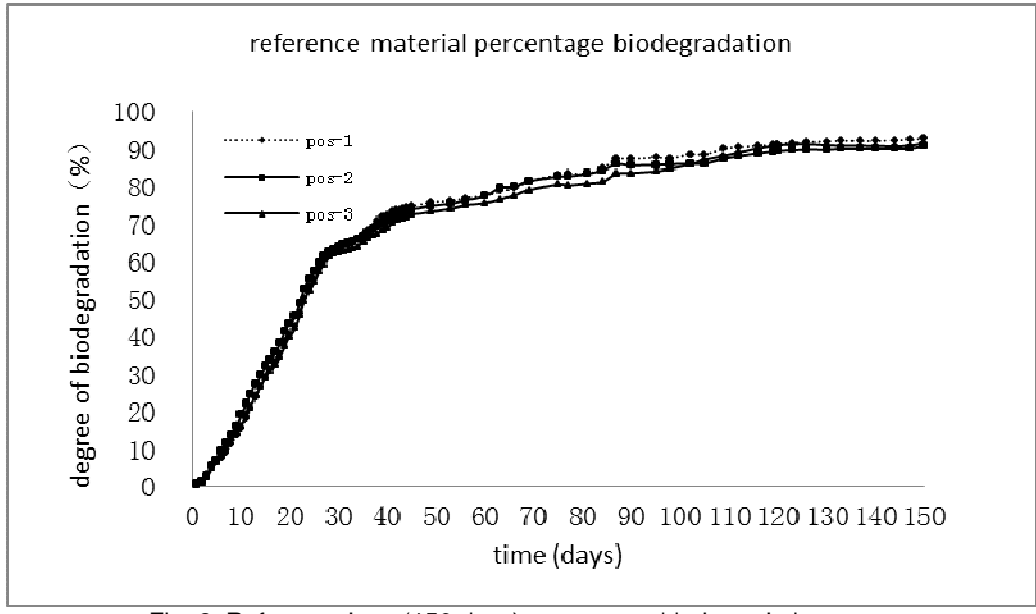


Fig. 2: Reference item (150 days) percentage biodegradation curve



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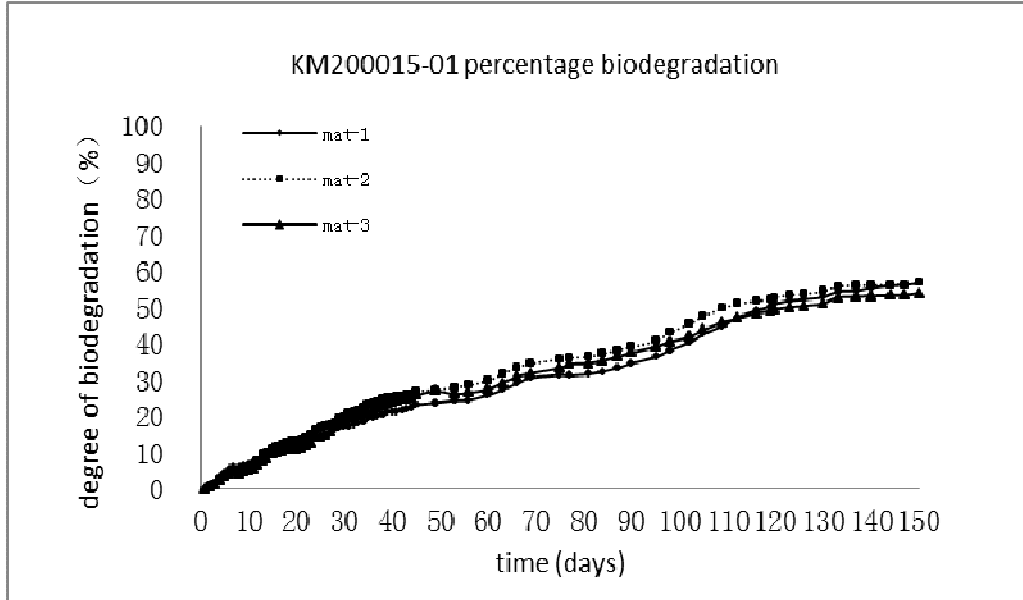


Fig. 3: KM200015-01 (150 days) percentage biodegradation curve



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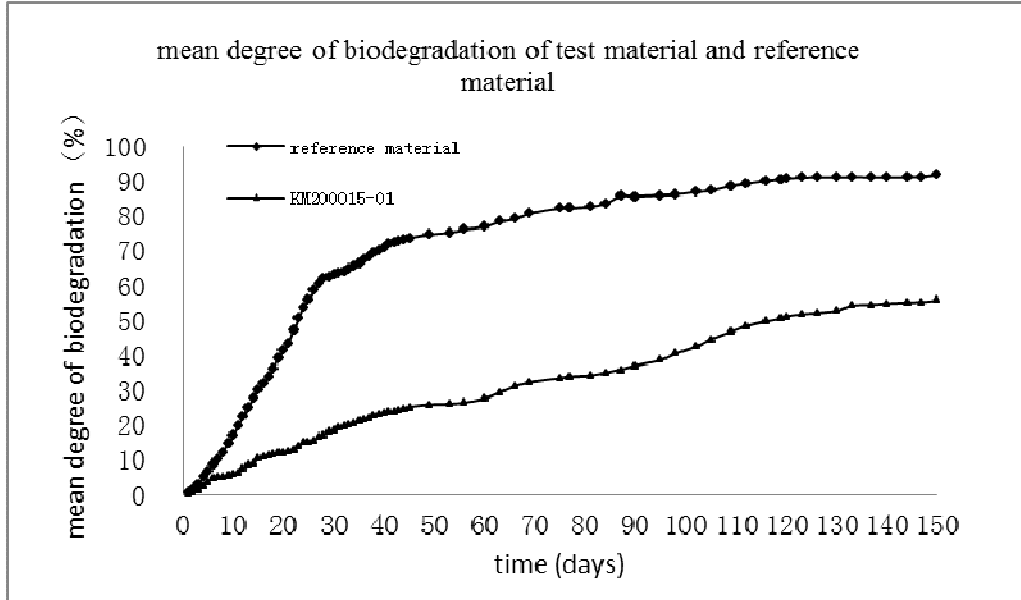


Fig. 4: The mean values (150 days) of percentage biodegradation curve of reference item and test item

7.5 Results

- (1) Percentage biodegradation of three replicates of reference item was 92.9%, 90.8% and 91.7% after 150 days of testing, respectively, and the mean value was 91.8%. The differences between the individual values of three replicates of reference item were 1.2 %, 1.1% and 0.1%. All were less than 20%.
- (2) Percentage biodegradation of three replicates of test item was 56.7%, 56.7% and 53.9% after 150 days of testing, respectively, and the mean value was 55.8%. The differences between the individual values of three replicates of test item were 1.7%, 1.6% and 3.3%. All were less than 20%.

8 Quality Control

- (1) During the first 10 days of testing, the compost inoculum produced 86.5mg CO<sub>2</sub> per gram of volatile solids, within the range of 50 to 150 mg CO<sub>2</sub> per gram of volatile solids.
- (2) The differences of percentage biodegradation between the individual values of three replicates for reference item were less than 20% at the end of the test.
- (3) The percentage degradation of reference item Thin-layer Chromatograph grade Cellulose was 73.7% after 45th days of testing, greater than 70%.

9 Guideline



(1). ISO 14855-1:2012 Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions - Method by analysis of evolved carbon dioxide - Part 1: General method.

Appendices: Test pictures (Note: The color of the sample may deviate from their pictures due to lighting and the use of different monitors.)

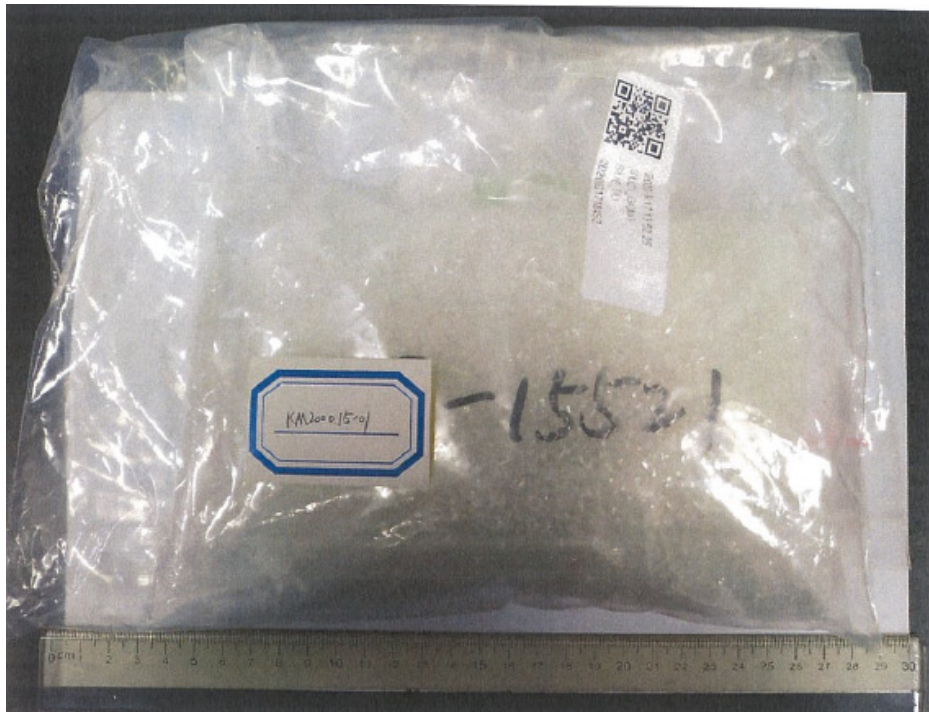


Fig. 6: The picture of KM200015-01



Fig. 7: The picture of KM20015-01 before test



Fig. 8: The picture of KM200015-01 and compost before test

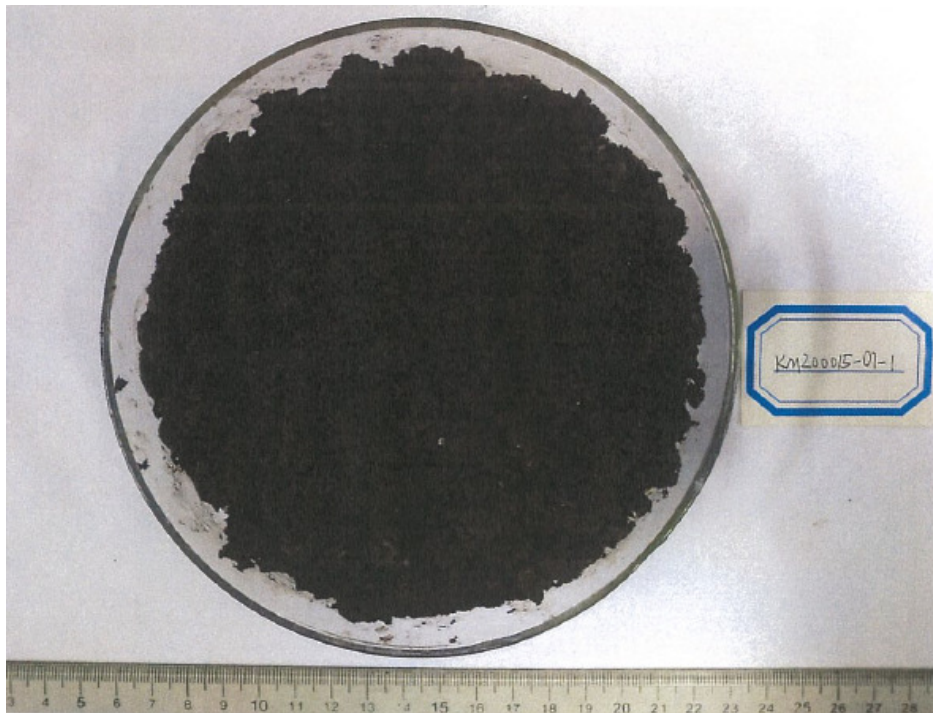


Fig. 9: The picture of KM200015-01 and compost after test (150 days, mat-1)



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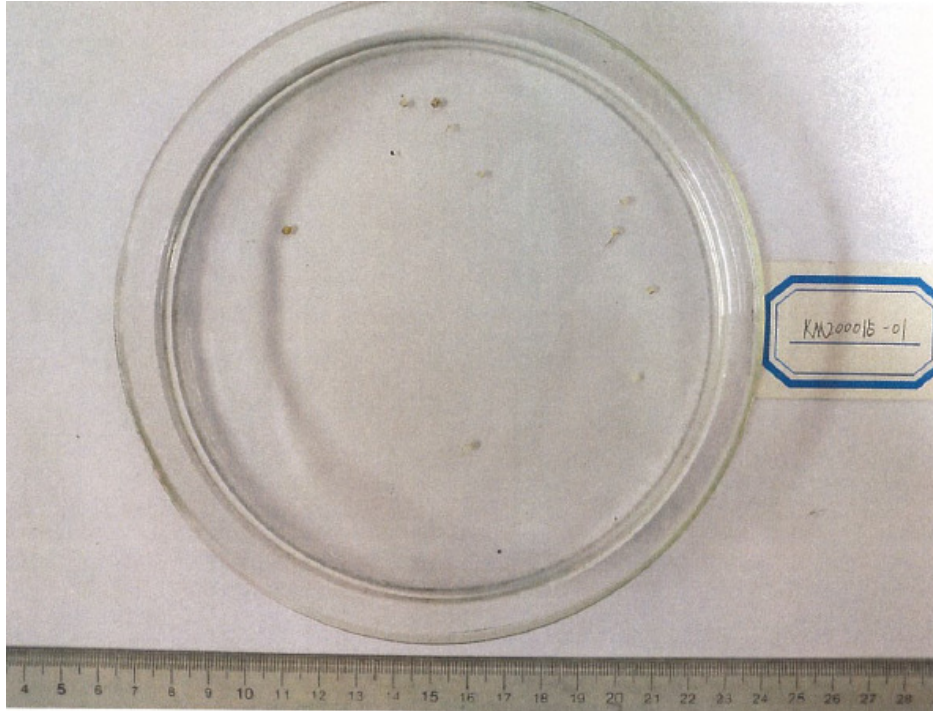


Fig. 10: The picture of washed KM200015-01 after test (150 days)

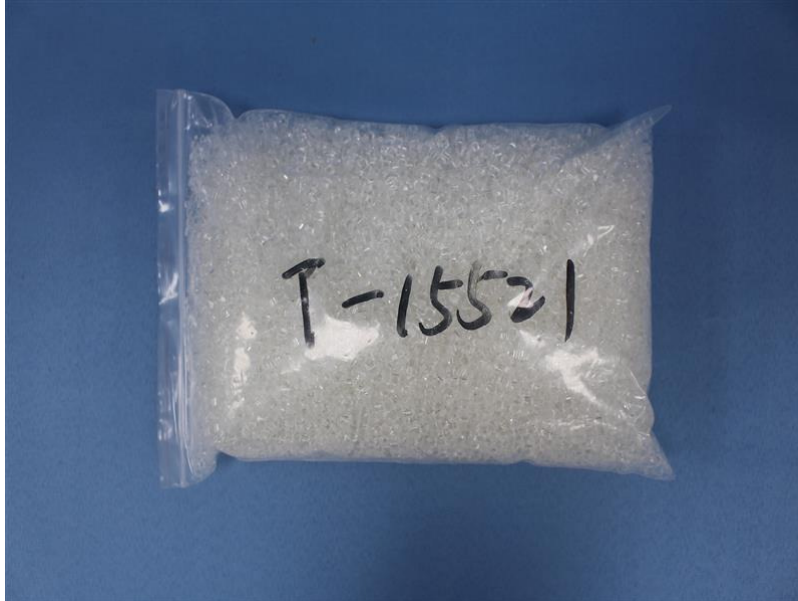
Remark: \*The test was carried out by external laboratory assessed as competent.

Test Report

GZF20-003741-01

Date: 15 Sep 2020

Sample photo:



GZF20-003741.001

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\*\*\* End \*\*\*

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