测试报告

Test Report

报告编号：ZX220525-010202

Report ID: ZX220525-010202

样品名称：PET 生物降解塑料粒子

Sample name: PET biodegradable plastic particles

委托单位：格域新材料科技（江苏）有限公司

Client: GREEN PACKAGING TECHNOLOGY（JIANG SU）CO.，LTD.

测试类型:委托测试

Test type: Commissioned inspection

测试要求：按照委托方要求测试

Test requirement: Test according to client's requirement

分析结果：见后页

Test result: See the back page

编制 Compile: 周燕 审核 Review: 王成龙 签发 Issue: 潘梦雪

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研究测试报告

（Research Test Report）

研究测试结果(Research test result)：

一、测试样品：PET 生物降解塑料粒子

I. Test sample: PET biodegradable plastic particles

二、测试周期：2022.06.08-2022.10.08

II. Test period: 2022.06.08-2022.10.08

三、测试方法：ASTM D5511-12 塑料材料在高固体厌氧消化条件下厌氧生物降解测定标准试验方法

III. Test Methods: ASTM D5511-12 Standard Test Method for Determination of Anaerobic Biodegradation of Plastic Materials under High Solid Anaerobic Digestion Conditions

四、接种物的准备：接种物以经过厌氧消化处理的家庭垃圾作为单一原料，相应的有机碎片粒径小于 60mm，接种物来自于干燥条件下的厌氧消化处理。准备好的接种物在同样的操作温度下进行大约 7d 的短期发酵，以确保在大型易分解样品分解期间，降低接种物自身生物分解的总体水平。

IV. Preparation of inoculum: The inoculum is made of household garbage treated by anaerobic digestion as a single raw material, and the particle size of the corresponding organic debris is less than 60mm. The inoculum comes from anaerobic digestion treatment under dry conditions. The prepared inoculum is fermented for about 7d at the same operating temperature, so as to ensure that the overall level of biodegradation of inoculum itself is reduced during the decomposition of large easily decomposed samples.

五、试验材料和参比材料的准备：测定试验材料和参比材料的总有机碳含量。每个容器内 20g 总干固体至少含有 8g 总有机碳。试验材料为 PET 生物降解塑料粒子，粒径小于 250μm。

V. Preparation of test materials and reference materials: Measure the total organic carbon content of test materials and reference materials. 20g of total dry solids in each container contains at least 8g of total organic carbon. The material is PET biodegradable plastic particles, the particle size of which is less than 250μm.

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（Research Test Report）

研究测试结果(Research test result)：

六、试验过程：把足够的接种物（约 10kg）从发酵容器中取出，手工混合均匀。各容器每加入湿重 1kg 的接种物，加入含有 15~20g 挥发性固体的试验材料或参比材料。每个容器最少加入 500g 湿重的接种物，搅拌 2~3min。3 个空白容器中仅装入接种物，使用与试验材料和参比材料相同的力度，手工搅拌 2~3min。将混合物导入消化容器，分散并轻轻按压，使其各处密度一致。将容器放入水浴或培养箱中并与气体检测或气体收集系统相连接，搅拌与连接的总时长不超过 2h，打开水浴加热装置。

消化容器在温度 52±2℃黑暗或弱光条件下培养 15d。测量不同时间间隔的生物气体产生量，试验前期需要频繁观察测定，随时间变化可减少观察次数。

VI. Test process: Take enough inoculum (about 10kg) out of the fermentation container and mix it evenly by hand. Each container is filled with 1kg inoculum with wet weight, and the test material or reference material containing 15~20g volatile solids is added. Add at least 500g of inoculum in each container, and stir for 2~3min. Only the inoculum was filled in three blank containers, and the mixture was stirred manually for 2~3min with the same strength as that of the test material and the reference material. Introduce the mixture into a digestion container, disperse and gently press it to make its density uniform everywhere. Put the container into a water bath or incubator and connect it with a gas detection or gas collection system. The total time of stirring and connection should not exceed 2h. Turn on the water bath heating device.

The digestion vessel was incubated at 52 ± 2 ℃ in dark or low light for 15d. To measure the biogas production at different time intervals, frequent observation and determination are required in the early stage of the experiment, and the observation times can be reduced with the change of time.

研究测试报告

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研究测试结果(Research test result)：

试验结束时将消化容器冷却至室温，确定试验的总产气量，记录室温和气压。开始 15 天内，每 3 天测定一次气体产生量，之后每 5 天测一次。

At the end of the test, cool the digestion vessel to room temperature, determine the total gas production of the test, and record the room temperature and air pressure. Within the first 15d, the gas production should be measured every 3d, and then every 5d.

七、试验结果有效性确认

VII. Validation of test results

1、试验 30d 后参比材料的生物分解率超过 70%；

1. The biodegradation rate of reference materials exceeded 70% after 30d of experiment;

2、试验结束后，每个参比材料消化容器的生物分解率与平均值之间的偏差不超过 20%。

2. After the test, the deviation between the biodegradation rate of each reference material digestion container and the average value is less than 20%.

研究测试报告

（Research Test Report）

研究测试结果(Research Test Result)：

八、试验结论

VIII. Test conclusion

项目 Project	根据释放出的碳量计算平均生物分解率（120d），% Calculate the average biodegradation rate (120d) according to the released carbon amount, %	观测 Observe
试验样品 Pilot sample	97.9	极少部分未分解 Very few parts are not decomposed.
参比材料 Reference material	99.3	几乎全部分解 Almost completely decomposed

项目 Project	试验材料降解率/参比材料降解率（120d），% Experimental material degradation rate/reference material degradation rate (120d), %
相对降解率 Relative degradation rate	98.6

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研究测试报告

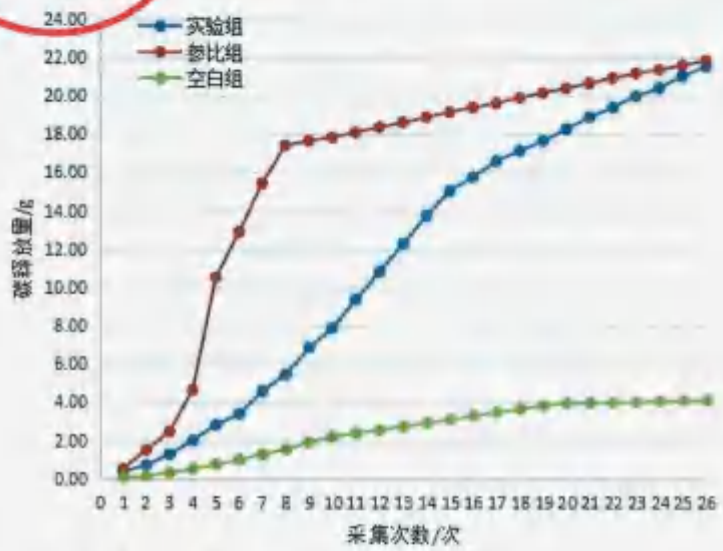
（Research Test Report）

研究测试结果(Research Test Result)：

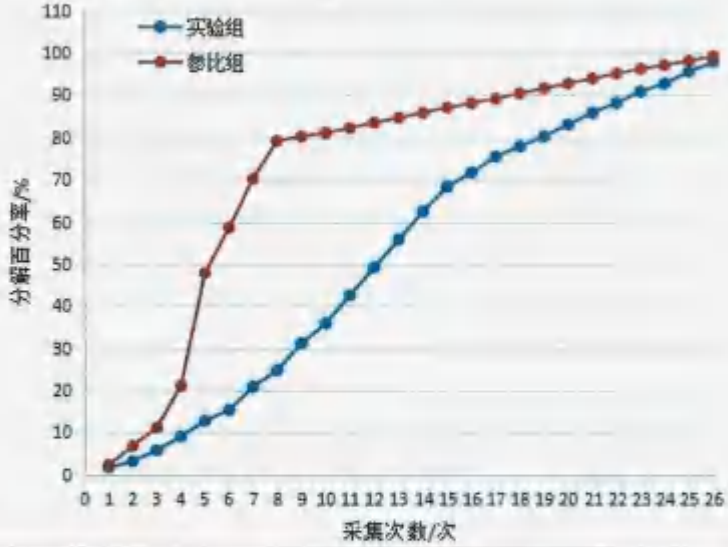
九、试验数据

IX. Test data

1、气体（碳）释放量曲线 Gas (C) release curve



2、生物分解率曲线 Biodegradation rate curve



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报告编号（Report ID）：ZX220525-010202　日期（Date）：2022.10.22　

样品图片（Sample picture）：

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Scan the query report for authenticity

报告结束

（End）

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This report is only responsible for the test results of the tested samples, and the test data only reflect the evaluation of the samples and are only used for the purposes of scientific research, teaching or internal quality control, enterprise product development, etc. The test results issued are limited to the internal use of specific clients, and have no proof role for the society, can't be used for legal purposes such as safeguarding rights, disputes, judicature, etc.The service party shall not assume any economic and legal liability for the use of test data, direct or indirect losses caused by the use and all legal consequences.

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If the content of the test results needs to be changed due to the reasons of the service party, the service party shall issue the test results for the applicant again, and bear the cost of changing the test results, and entrust the service party to submit the restore test results. If the content of the test results needs to be changed due to the reasons of the applicant, the applicant shall submit an application for modification to the service party. If the test result is re-issued after the examination and approval of the service party, the related expenses shall be borne by the applicant, and the applicant shall submit the test result to the service party for restoration.

SGS

TEST REPORT

No. : GZMR220702418801
Date : Aug 09, 2022
Page: 1 of 24

CUSTOMER NAME: GREEN PACKAGING TECHNOLOGY(JIANGSU) CO,LTD.
ADDRESS: NO.199,HONGXI ROAD,WUJIN DISTRICT,CHANGZHOU CITY,JIANGSU PROVINCE

Sample Name : PET DEGRADATION PARTICLES
Material : POLYESTER PET

Above information and sample(s) was/were submitted and confirmed by the client. SGS, however, assumes no responsibility to verify the accuracy, adequacy and completeness of the sample information provided by client.

****

SGS Ref. No. : CP22-041944
Date of Receipt : Jul 29, 2022
Testing Start Date : Jul 29, 2022
Testing End Date : Aug 09, 2022
Test result(s) : For further details, please refer to the following page(s)
(Unless otherwise stated the results shown in this test report refer only to the sample(s) tested)

Signed for
SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch

May Huo
Authorized signatory

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TEST REPORT

No. : GZMR220702418801
Date : Aug 09, 2022

Summary of Results:

No.	Test Item	Test Method	Result		Conclusion
1	Tensile Test	GB/T 1040.1-2018 & GB/T 1040.2-2006	Tensile Strength	34.6MPa	/
			Tensile Strain at Break	1.1%	
2	Compressive Strength	GB/T 1041-2008	158MPa		/
3	Compressive Modulus	GB/T 1041-2008	3270MPa		/
4	Flexural Test	GB/T 9341-2008	Flexural Strength	83.4MPa	/
			Flexural Modulus	3140MPa	
5	Tensile Modulus	GB/T 1040.1-2018 & GB/T 1040.2-2006	3250MPa		/
6	Charpy Impact Strength	GB/T 1043.1-2008	Notched	1.5kJ/m² C (complete break)	/
			Unnotched	11kJ/m² C (complete break)	
7	Izod Impact Strength	GB/T 1843-2008	Notched	1.5kJ/m² C (complete break)	/
			Unnotched	11kJ/m² C (complete break)	
8	Glass Transition Temperature	GB/T 19466.2-2004	See result		/

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9	Thermogravimetry Analysis	ISO 11358-1:2022	See result	/
10	Deflection Temperature under Load	GB/T 1634.1-2019 & GB/T 1634.2-2019 Method A	71℃	/
11	Vicat Softening Temperature	GB/T 1633-2000 Method B50	205℃	/

Note: Pass : Meet the requirements;
Fail : Does not meet the requirements;
/ : Not Apply to the judgment.

Original Sample Photo:

Original sample A

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TEST REPORT

1.Test Item: Tensile Test

Sample Description: Plastic raw material

Test Method: GB/T 1040.1-2018 & GB/T 1040.2-2006

Test Condition:

Specimen: Type 1A

Specimen thickness: 4.03mm

Testing speed: 5 mm/min

Gauge length: 75mm

Initial distance between grips: 115 mm

Lab Environmental Condition: (23 ± 2) ℃, (50 ± 5) % RH

Test Result:

Test Item	Test Result
Tensile Strength	34.6MPa
Tensile Strain at Break	1.1%

Note: Test specimens were injection molded.

Test Photo:

During Test

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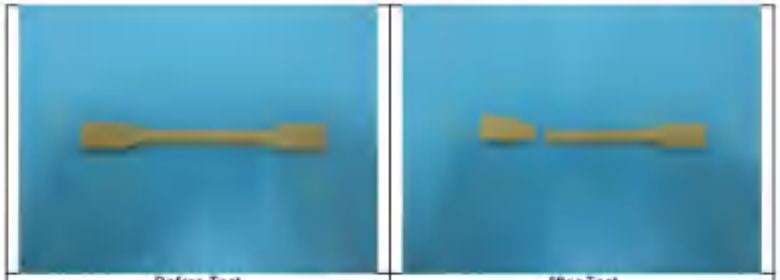

Before Test	After Test

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
High-Low temperature Universal testing machine	2020	GZMR-PL-E264	2022-06-22	2023-06-21

2.Test Item: Compressive Strength
Sample Description: Plastic raw material
Test Method: GB/T 1041-2008
Test Condition:
Specimen: Type B
Specimen thickness: 4.24mm
Testing speed: 1mm/min
Lab Environmental Condition: 23±2℃, 50±5%RH
Test Result:

Test Item	Test Result
Compressive strength	158MPa

Note: Test specimens were cut from the injection molded sample.

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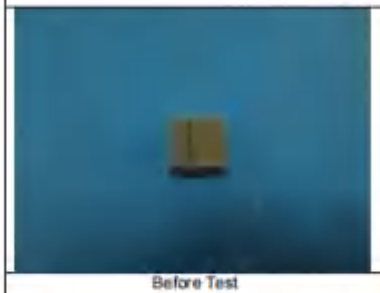
Test Photo:

During Test



Before Test

After Test

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
Universal testing machine	E45.105	GZMR-PL-E307	2022-03-15	2023-03-14

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3.Test Item: Compressive Modulus

Sample Description: Plastic raw material

Test Method: GB/T 1041-2008

Test Condition:

Specimen: Type A

Specimen thickness: 4.16mm

Testing speed: 1mm/min

Lab Environmental Condition: 23±2℃, 50±5%RH

Test Result:

Test Item	Test Result
Compressive Modulus	3270MPa

Note: Test specimens were cut from the injection molded sample.

Test Photo:

During Test

Before Test

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TEST REPORT

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
High-Low temperature Universal testing machine	Z020	GZMR-PL-E264	2022-06-22	2023-06-21

4.Test Item: Flexural Test

Sample Description: Plastic raw material

Test Method: GB/T 9341-2008

Test Condition:

Specimen: 80mm×9.91mm×4.00mm

Testing speed: 2mm/min

Span: 64mm

Lab Environmental Condition: 23±2℃, 50±5%RH

Test Result:

Test Item	Test Result
Flexural Strength	83.4MPa
Flexural Modulus	3140MPa

Note: Test specimens were injection molded.

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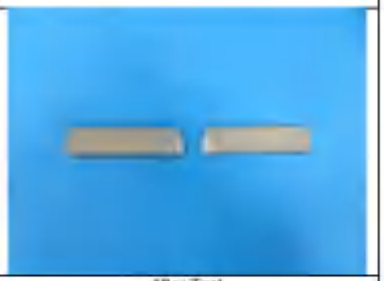
TEST REPORT

No. : GZMR220702418801
Date : Aug 09, 2022

Test Photo:

During Test

Before Test



After Test

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
Universal Testing Machine	Z1.0	GZMR-PL-E252	2021-12-24	2022-12-23

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TEST REPORT

5.Test Item: Tensile Modulus

Sample Description: Plastic raw material

Test Method: GB/T 1040.1-2018 & GB/T 1040.2-2006

Test Condition:

Specimen: Type 1A

Specimen thickness: 4.03mm

Testing speed: 1 mm/min

Gauge length: 75mm

Initial distance between grips:115 mm

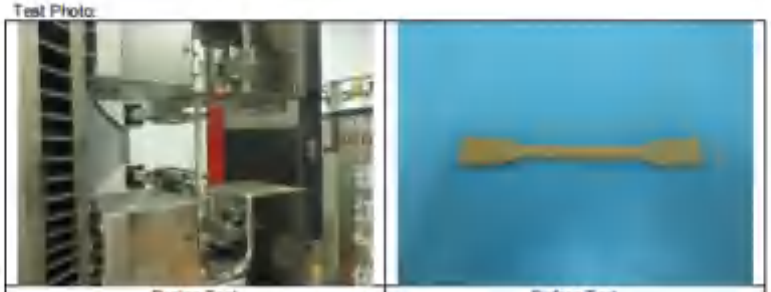
Lab Environmental Condition: (23 ± 2) ℃, (50 ± 5) % RH

Test Result:

Test Item	Test Result
Tensile Modulus	3250MPa

Note: Test specimens were injection molded.

Test Photo:



During Test | Before Test

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TEST REPORT

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
High-Low temperature Universal testing machine	Z020	GZMR-PL-E264	2022-06-22	2023-06-21

6.Test Item: Charpy Impact Strength

Sample Description: Plastic raw material

Test Method: GB/T 1043.1-2008

Test Condition:

Notched:

Specimen: GB/T 1043.1/1eA (Notch preparation: machining)

Specimen thickness: 3.99mm

The capacity of the pendulum: 1J

Impact speed: 2.90m/s

Span: 62mm

Unnotched:

Specimen: GB/T 1043.1/1eU

Specimen thickness: 3.99mm

The capacity of the pendulum: 4J

Impact speed: 2.90m/s

Span: 62mm

Lab Environmental Condition: 23±2℃, 50±5%RH

Test Result:

Test Item	Test Result
Charpy Notched Impact Strength	1.5kJ/m² C (complete break)
Charpy Unnotched Impact Strength	11kJ/m² C (complete break)

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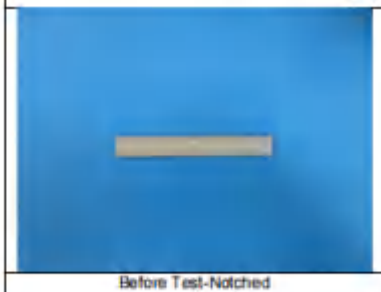
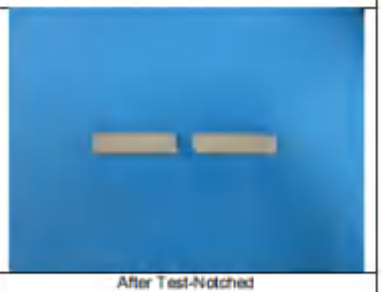
Note: Test specimens were injection molded.

Test Photo:

During Test



Before Test-Notched



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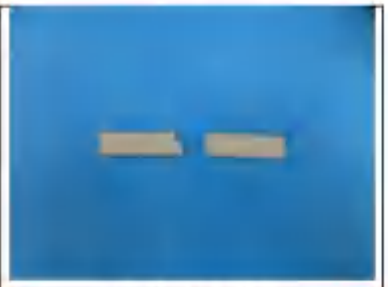
Before Test-Unnotched



After Test-Unnotched

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
Impact Tester	HIT50P	GZMR-PL-E283	2022-07-20	2023-07-19

7.Test Item: Izod Impact Strength

Sample Description: Plastic raw material

Test Method: GB/T 1843-2008

Test Condition:

Notched:

Specimen: GB/T 1843/A (Notch preparation: machining)

Specimen thickness: 3.98mm

The capacity of the pendulum: 1J

Impact speed: 3.46m/s

Unnotched:

Specimen: GB/T 1843/U

Specimen thickness: 3.98mm

The capacity of the pendulum: 2.75J

Impact speed: 3.46m/s

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TEST REPORT

No. : GZMR220702418801
Date : Aug 09, 2022

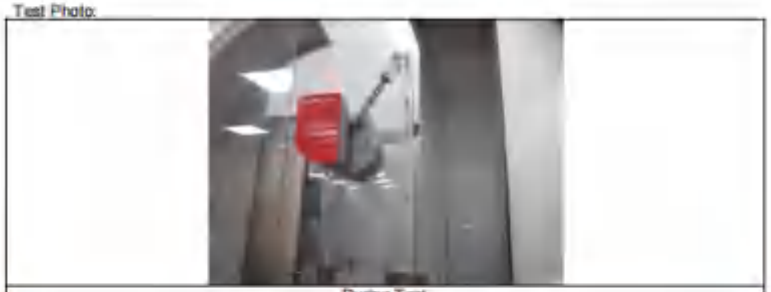
Lab Environmental Condition: 23±2℃, 50±5%RH

Test Result:

Test Item	Test Result
Izod Notched Impact Strength	1.8kJ/m^2 C (complete break)
Izod Unnotched Impact Strength	11kJ/m^2 C (complete break)

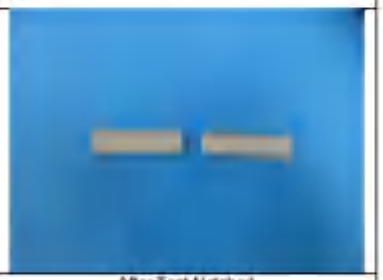
Note: Test specimens were injection molded.

Test Photo:



During Test

Before Test-Notched



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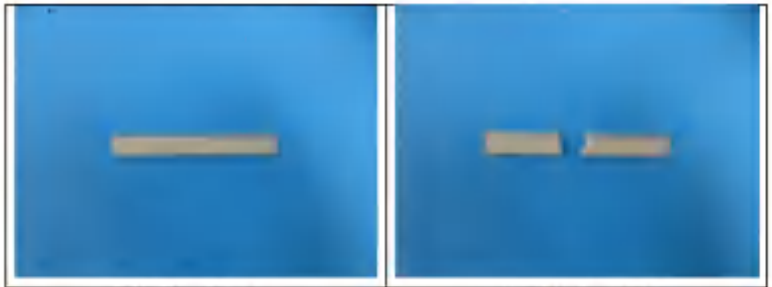

Before Test-Unnotched	After Test-Unnotched

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
Impact Tester	HIT50P	GZMR-PL-E283	2022-07-20	2023-07-19

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8.Test Item: Glass Transition Temperature
Sample Description: Plastic raw material
Test Method: GB/T 19466.2-2004, analysis was performed by DSC.
Test Condition:

Type of sample container: Al,
Purge gas flow rate (Nitrogen: 99.999%): 50ml/min,
Equilibrate at 0℃,
Ramp 20℃/min to 150℃, isothermal for 5min,
Quench cool to 0℃, isothermal for 15min,
Repeat ramp 20℃/min to 150℃.

Test Result:

Test Item	First heating scan (DSC curve see Fig.1)	Second heating scan (DSC curve see Fig.2)
Extrapolated onset temperature T_{eig}	74℃	Glass Transition Temperature were not found in the temperature range of 0~150℃
Midpoint temperature T_{mg}	76℃	
Extrapolated end temperature T_{efg}	78℃	

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Fig.1

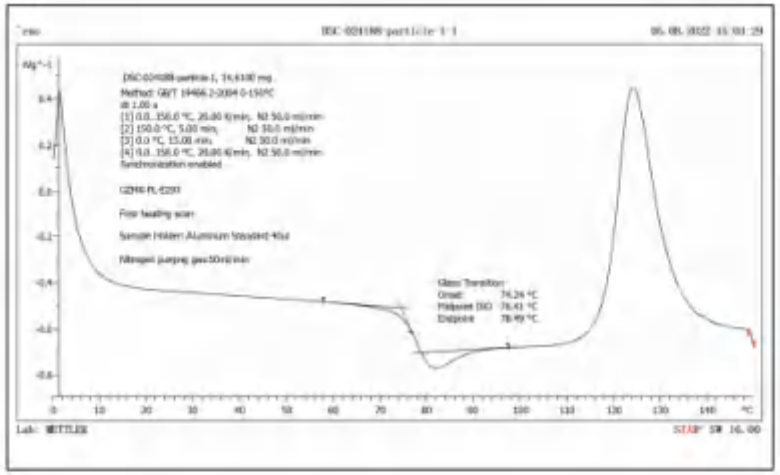

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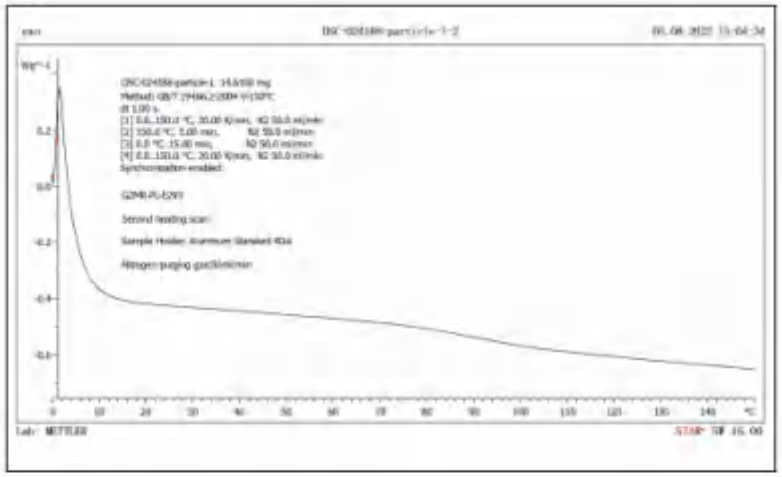
Fig.2



Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
DSC	DSC 3	GZMR-PL-E293	2022-03-18	2024-03-17

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9.Test Item: Thermogravimetric Analysis

Sample Description: Plastic raw material

Test Method: ISO 11358-1:2022, analysis was performed by TGA.

Test Condition:

Material of specimen holder: Platinum pan;

Balance purging gas flow rate (Nitrogen): 10ml/min;

Sample purging gas flow rate (Nitrogen):25 ml/min;

Equilibrate at 40℃;

Ramp 10℃/min to 800℃.

Test Result:

Test Item	Test Result (TGA curve see Fig. 1)
The starting point of temperature (T_A)	414.92℃
The mid-point of temperature (T_C)	436.49℃
The end point of temperature (T_B)	458.07℃
The loss in mass (M_L)	84.2%
The residue in mass (R)	15.8%

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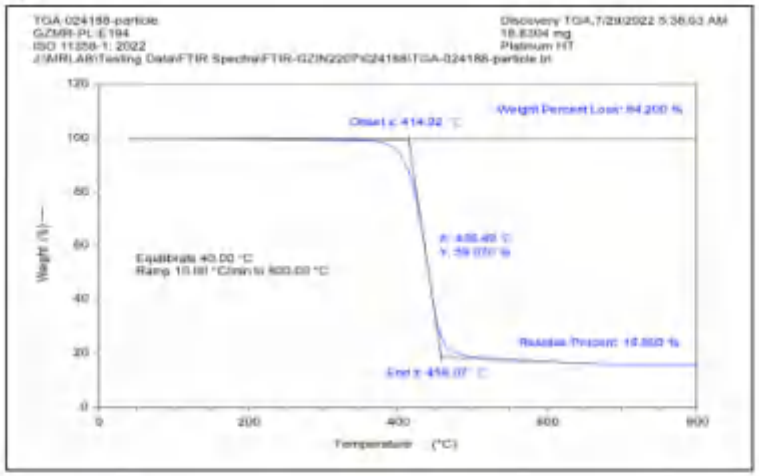
TEST REPORT

No. : GZMR2207024188O1
Date : Aug 09, 2022

Fig.1



Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
TGA	Discovery TGA	GZMR-PL-E194	2021-12-13	2023-12-12

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TEST REPORT

No. : GZMR220702416801
Date : Aug 09, 2022

10.Test Item: Deflection Temperature under Load

Sample Description: Plastic raw material

Test Method: GB/T 1634.1-2019 & GB/T 1634.2-2019 Method A

Test Condition:

Specimen: 80mm×9.86mm×3.99mm

Heat-transfer media: Silicone oil

Tr1.8

Rate of temperature:120℃/h

Span: 64mm

Lab Environmental Condition: (23±2)℃, (50±5)%RH

Test Result:

Test Item	Test Result
Deflection Temperature under Load	71℃

Note: Test specimens were injection molded.

Test Photo:

During Test

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Before Test	After Test

Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
HDT and VICAT Tester	6970.000	GZMR-PL-E091	2022-01-11	2023-01-10

11.Test Item: Vicat Softening Temperature
Sample Description: Plastic raw material
Test Method: GB/T 1633-2000 Method B50
Test Condition:
Specimen thickness: 3.23mm
Heat-transfer media: Silicone oil
Rate of temperature: 50℃/h
Load: 50N
Lab Environmental Condition: 23±2℃, 50±5%RH
Test Result:

Test Item	Test Result
Vicat Softening Temperature	205℃

Note: Test specimens were cut from the injection molded sample.

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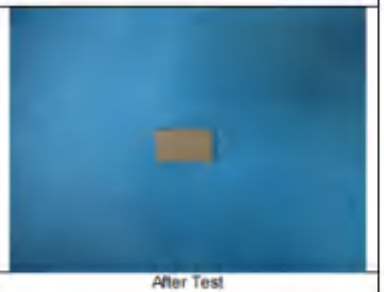
TEST REPORT

No. : GZMR220702418801
Date : Aug 09, 2022

Test Photo:

During Test

Before Test



After Test

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Equipment Information:

Equipment	Model	Equipment No.	Calibration date	Next Calibration date
HDT and VICAT Tester	P/N 6911.000	GZMR-PL-E009	2022-05-24	2023-05-23

Appendix information:
In the territory of the People's Republic of China, the test report without CMA logo expresses the test report shall only be used for client scientific research, teaching, internal quality control, product research and development, etc., and just for client internal reference.

******** End of report********

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检测报告

编号 : GZMR220702418801_CN

日期 : 2022-08-09

客户名称: 格域新材料科技（江苏）有限公司

客户地址: 江苏省常州市武进区虹西路 199 号一号楼

样品名称 : PET 降解粒子

材质 : 聚酯 PET

以上信息及样品由客户提供及确认，SGS 不承担证实客户提供信息的准确性，适当性和(或)完整性的责任。

SGS 参考号 : CP22-041944

收样日期 : 2022-07-29

测试开始时间 : 2022-07-29

测试结束时间 : 2022-08-09

测试结果 : 请见下页（除另有特别说明外，此报告结果仅对测试样品负责）

通标标准技术服务有限公司广州分公司

授权签名

霍洁梅 授权签字人

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检测报告

结果总结：

序号	测试项目	测试方法	结果		结论
1	拉伸测试	GB/T 1040.1-2018 & GB/T 1040.2-2006	拉伸强度	34.6MPa	/
			断裂拉伸应变	1.1%	
2	压缩强度	GB/T 1041-2008	158MPa		/
3	压缩模量	GB/T 1041-2008	3270MPa		/
4	弯曲测试	GB/T 9341-2008	弯曲强度	83.4MPa	/
			弯曲模量	3140MPa	
5	拉伸模量	GB/T 1040.1-2018 & GB/T 1040.2-2006	3250MPa		/
6	简支梁冲击强度	GB/T 1043.1-2008	缺口	1.5kJ/m² C (完全破坏)	/
			无缺口	11kJ/m² C (完全破坏)	
7	悬臂梁冲击强度	GB/T 1843-2008	缺口	1.8kJ/m² C (完全破坏)	/
			无缺口	11kJ/m² C (完全破坏)	
8	玻璃化转变温度	GB/T 19466.2-2004	详见结果		/
9	热失重分析	ISO 11358-1:2022	详见结果		/
10	负荷变形温度	GB/T 1634.1-2019 & GB/T 1634.2-2019 方法 A	71℃		/
11	维卡软化温度	GB/T 1633-2000 方法 B50	205℃		/

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备注： 合格：达到要求
不合格：未达到要求
/：不下判定

原样照片：

原样 A

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检测报告

1.测试项目：拉伸测试

样品描述：塑料粒料

测试方法：GB/T 1040.1-2018 & GB/T 1040.2-2006

测试条件：

试样：1A 型

试样厚度：4.03mm

测试速度：5 mm/min

标距：75 mm

初始夹具间距：115 mm

实验室环境条件：(23 ± 2) ℃，(50 ± 5) % RH

测试结果：

测试项目	测试结果
拉伸强度	34.6MPa
断裂拉伸应变	1.1%

备注：测试试样为注塑成型。

测试照片：

测试中

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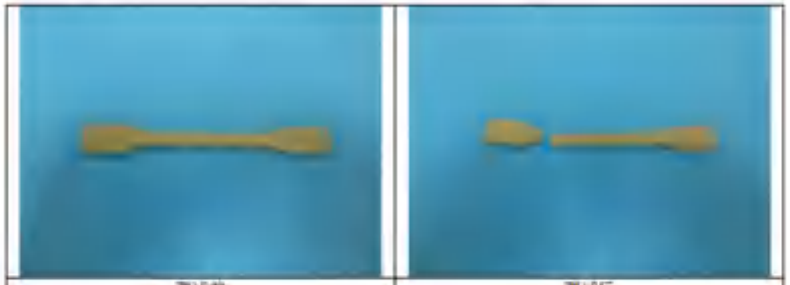

测试前	测试后

设备信息：

设备	型号	设备编号	检准日期	下次检准日期
高低温万能材料试验机	2020	GZMR-PL-E264	2022-06-22	2023-06-21

2.测试项目：压缩强度

样品描述：塑料粒料

测试方法：GB/T 1041-2008

测试条件：

试样：B型

试样厚度：4.24mm

测试速度：1mm/min

实验室环境条件：23±2℃，50±5%RH

测试结果：

测试项目	测试结果
压缩强度	158MPa

备注： 测试试样从注塑成型后的样品中裁取。

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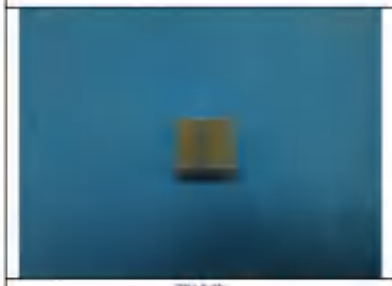
测试照片：

测试中



测试前

测试后

设备信息：

设备	型号	设备编号	校准日期	下次校准日期
电子万能材料试验机	E45.105	GZMR-PL-E307	2022-03-15	2023-03-14

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3.测试项目：压缩模量

样品描述：塑料粒料

测试方法：GB/T 1041-2008

测试条件：

试样：A型

试样厚度：4.16mm

测试速度：1mm/min

实验室环境条件：23±2℃，50±5%RH

测试结果：

测试项目	测试结果
压缩模量	3270MPa

备注： 测试试样从注塑成型后的样品中截取。

测试照片：

测试中

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