

客户名称: 东莞市锦源环保科技发展有限公司

客户地址: 广东省东莞市常平镇白石岗振兴二路2号1栋

样品名称: 纸托 样品批号: 生产日期:

生产商: 东莞市锦源环保科技发展有限公司 样品其他信息: 纸片是从成品纸托按要求裁剪的

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SGS 样品编号: GZAFN1908014745S.001

SGS 相关号: SPCM190022-05R

样品接收日期: 2020-05-12

样品检测日期: 2020-05-12~2020-08-14

# 检测要求:

根据客户要求进行检测

#### 检测方法:

请参见下页

## 检测结果:

请参见下页

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### 检测结果:

#### 1 摘要

本试验检测了样品(样品名称:纸托)在受控堆肥条件下的最终需氧生物分解。在2L的试验体系中,以样品作为有机碳源,用无二氧化碳的空气以受控速率对试验混合物进行曝气。通过测定二氧化碳产生量来确定降解率。

在本试验条件下,试验 154 天后,参比材料微晶纤维素的平均生物分解百分率是 92.3%;测试样品的平均生物分解百分率为 75.7%。

本试验过程满足如下条件: 试验前 10d 内空白容器产生的二氧化碳量的平均值为 130.2mgCO<sub>2</sub>/g 挥发性固体,在 50mg-150mgCO<sub>2</sub>/g 挥发性固体范围内,因此前 10 天试验有效。试验第 45d 参比材料微晶纤维素三个反应瓶的平均生物分解百分率为 77.8%,大于 70%。本试验有效。

#### 2引言

# 2.1 试验名称

纸托在受控堆肥条件下最终需氧生物分解能力的测定\*

# 2.2 试验目的

测定样品纸托在受控堆肥条件下的最终需氧生物分解能力。

#### 2.3 原理

本测定方法在模拟强烈需氧堆肥条件下,测定试验材料最终需氧生物分解能力和崩解程度。使用的培养土来自于稳定的、腐熟的堆肥,如可能,从城市固体废弃物中有机物的堆肥中获取。

试验材料与培养土混合,导入静态堆肥容器。在该容器中,混合物在规定的温度、氧浓度和湿度下进行强烈的需氧堆肥。试验周期不超过6个月。

在试验材料的需氧生物分解过程中,二氧化碳、水、矿化无机盐及新的生物质都是最终生物分解的产物。在试验中连续监测、定期测量产生的二氧化碳,累计产生的二氧化碳量。试验材料在试验中实际产生的二氧化碳量与该材料可以产生的二氧化碳的理论量之比为生物分解百分率。根据实际测量的总有机碳(TOC)含量可以计算出二氧化碳的理论释放量。生物分解百分率不包括已转化为新的细胞生物质的碳量,因为它在试验周期内不代谢为二氧化碳。

# 3 试验材料

3.1 样品

样品编号: M190022-01

3.2 参比物

参比材料

名称: 微晶纤维素 (TLC (thin-layer chromatography) grade cellulose)

参比物编号: R19002

批号: 20181121

来源: 国药集团化学试剂有限公司

分子式: (C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>)<sub>n</sub> 分子量: (162.14)<sub>n</sub> CAS No.: 9004-34-6

性状: 白色或类白色粉末

纯度:色谱级

保存条件: 室温干燥保存

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3.3 接种物

名称: 好氧堆肥 来源: 自制 肥龄: 3个月

前期处理: 过 0.5cm 筛筛选, 去除杂质和惰性物质。

3.4 试验条件

试验于 58℃±2℃恒温, 弱光, 没有任何会影响微生物生长的蒸汽条件下进行。

- 3.5 仪器设备
- (1) 反应装置;
- (2) 压缩空气制备装置;
- (3) 气体吸收装置;
- (4) 气体流量控制器;
- (5) 无二氧化碳空气湿度增加装置;
- (6) 无二氧化碳空气制备装置;
- (7) 便携式智能气体检测报警仪;
- (8) 恒温装置。
- 4 试验前准备工作
- 4.1 选择、清洗和准备试验容器
- 4.2 接种物的准备

堆肥土经除杂质及筛选等制备后,测定其 pH、水分、挥发性固体、总氮和总有机碳含量等堆肥质量控制 指标。经测定,本试验中所用堆肥 pH 为 7.55,水分含量为 48.2%,总干固体含量为 51.8%,挥发性固体 含量(挥发性固体比总干固体)为27.6%,总氮含量为1.10%,总有机碳含量为17.69%。

4.3 吸收瓶使用串联方式

每个吸收瓶中加入 400mL 20g/L 的氢氧化钠溶液作为吸收剂,每个反应容器配备串联的三个吸收瓶。

- 4.4 反应容器的数量
- 3 个装试验材料的容器(mat-1, mat-2, mat-3);
- 3 个装阳性参比材料的容器(pos-1, pos-2, pos-3);
- 3 个空白容器(com-1, com-2, com-3)。
- 4.5样品的准备

对样品粉碎处理后进行总有机碳含量等指标测定。经测定,样品总有机碳含量为40.76%,水分含量为 6.9%。然后按培养土的干重与试验材料的干重比约为 6:1 的比例进行混合制备样品试验体系,加 360.0g 接种物(干重)和60.0g样品(干重)到反应容器中进行试验。

4.6 参比物的准备

对参比物进行水分和总有机碳含量等指标测定。参比材料水分含量为4.6%,总有机碳含量为41.44%。

# 5 试验方法

- (1) 用无 CO₂的水饱和空气以 0.05L/min 流量对试验体系进行曝气,于 58°C±2°C条件下进行试验。
- (2)第一周每天测定两次反应容器 O₂浓度含量,以后测量次数可以减少。必要时,调节空气流量。在开 始的 45d 内每天测定一次 CO2的吸收量,之后每周测量 2次。
- (3) CO2的测定:

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#### 检测报告 报告编号: GZAFN1908014745S008

氢氧化钠吸收法:测定 CO2时,拆出直接连接防倒吸装置的氢氧化钠吸收瓶来测定,其余两个吸收瓶顺 序前移连接至防倒吸装置,并在末端连接上一个新配制的氢氧化钠吸收瓶。拆下的吸收瓶用 HCI 标准溶液 进行滴定。

- (4)每天对试验装置进行气密性检查。
- (5) 每周对试验容器混合物进行颠倒振荡混匀,同时测定观察混合物的 pH 以及以下性状: 试验容器排 放气的气味,堆肥湿度、色泽、霉菌生成,试验材料结构变化、崩解程度。对试验开始前及试验 154 天的 样品等进行拍照,结果见附图 6-8。
- (6) 计算二氧化碳理论释放量

按式(1)计算每个堆肥容器中试验材料产生的二氧化碳理论释放量(ThCO₂),以克(q)表示。

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

Мтот: 试验开始时加入堆肥容器的试验材料中的总干固体,单位为克(g);

Стот: 试验材料中总有机碳与总干固体的比,单位为克每克 (g/g);

44 和 12: 分别表示二氧化碳的分子量和碳的原子量。

(7) 计算生物分解百分率

每个测量期间用式(2)根据累计放出的二氧化碳的量,计算试验材料生物分解百分率Dt(%):

 $Dt = [(CO_2)_T - (CO_2)_B] / ThCO_2 \times 100$ 

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式中:

(CO2)T: 每个含有试验混合物的堆肥容器累计放出的二氧化碳量,单位为克每个容器(q/容器);

(CO<sub>2</sub>)<sub>B</sub>: 空白容器累计放出的二氧化碳量平均值,单位为克每个容器(q/容器);

ThCO2: 试验材料产生的二氧化碳理论释放量,单位为克每个容器(q/容器)。

如果每个结果的相对偏差小于 20%,则计算平均生物分解百分率,否则,单独使用每一个堆肥容器的数

使用同样方法计算参比材料的生物分解率。

# 6 结果判定依据

6.1 45d 参比材料的生物分解率超过 70%。

6.2 将每一个含有试验材料、参比材料的堆肥容器及空白堆肥容器放出的累计二氧化碳释放量相对时间作 曲线,作出试验材料和参比材料的生物分解百分率与时间的关系曲线,如果各个测量值的偏差不超过 20%,则采用平均值,否则作出每一个堆肥容器的生物分解曲线。

6.3 在培养前 10d 内,空白容器中培养土产生 50mg-150mg CO<sub>2</sub>/g 挥发性固体(平均值)。

#### 7 数据统计及结果

7.1 计算二氧化碳理论释放量(ThCO<sub>2</sub>)

### 表 1 计算二氢化碳理论释放量(ThCO<sub>2</sub>)

名称		接种物		1	散晶纤维素		N	1190022-0	)1			
序号	1	2	3	4	5	6	7	8	9			
培养土实际加 入量(湿 重), <b>g</b>	694.98	694.99	694.98	695.00	694.99	694.97	695.00	694.97	694.98			

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续表 1 计算二氧化碳理论释放量(ThCO<sub>2</sub>)

名称		接种物		í	微晶纤维素	E.	N	1190022-0	)1
序号	1	2	3	4	5	6	7	8	9
培养土总干固 体含量,g	360.0	360.0	360.0	360.0	360.0	360.0	360.0	360.0	360.0
待测样品实际 加入量, <b>g</b>	/	/	/	62.89	62.89	62.90	64.48	64.47	64.43
$M_{TOT}$ , $g$	/	/	/	60.0	60.0	60.0	60.0	60.0	60.0
TOC, %		17.69			41.44			40.76	
$C_{\text{TOT}}$ , $g/g$		0.1769			0.4144			0.4076	
ThCO <sub>2</sub> ,g/容 器	/	/	/	91.2	91.2	91.2	89.7	89.7	89.7

备注: ThCO<sub>2</sub>=M<sub>TOT</sub> × C<sub>TOT</sub> × 44/12 (详见第5章节)

7.2 在检测过程中累计二氧化碳产生量及生物分解百分率 在检测过程中二氧化碳累计产生量及生物分解百分率见表 2:

表 2 检测过程中累计二氧化碳产生量及生物分解百分率

衣 2 位侧以往中系订二氧化恢广生里及生物分胜日分平											
	n_4 v1		累计 CO	2产生量 (	g/容器)		<u> </u>	生物分解音	百分率(%	s)	
日期	时间 (天)	空白	阳性参	比物	M1900	)22-01	阳性	参比物	M1900	022-01	
	()()	平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均	
			0.82		1.83		0.3		1.4		
20190814	1	0.59	0.82	0.80	1.56	1.46	0.3	0.3	1.1	1.0	
			0.75		0.99		0.2		0.4		
			5.06		5.50		3.4		3.9		
20190815	2	1.98	5.48	5.40	5.33	5.37	3.8	3.7	3.7	3.8	
			5.66		5.29		4.0		3.7		
			9.93		9.71		7.4		7.3		
20190816	3	3.20	9.21	9.71	8.06	9.26	6.6	7.1	5.4	6.8	
			9.98		10.02		7.4		7.6		
			14.71		14.14		11.6		11.1		
20190817	4	4.16	13.78	14.33	15.02	14.63	10.5	11.1	12.1	11.7	
			14.49		14.73		11.3		11.8		

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# 续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

			累计 CO	2产生量(	g/容器)			累计降角	舜率(%)	
日期	时间 (天)	空白	阳性参	比物	M1900	)22-01	阳性	参比物	M1900	)22-01
	()()	平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			19.99		19.78		16.2		16.3	
20190818	5	5.18	18.67	19.46	19.44	19.78	14.8	15.6	15.9	16.3
			19.71		20.13		15.9		16.7	
			23.21		23.72		18.0		18.9	
20190819	6	6.81	21.98	23.16	23.87	24.13	16.6	17.9	19.0	19.3
			24.29		24.80		19.2		20.1	
			26.87		29.88		20.7		24.4	
20190820	7	8.01	25.08	26.51	30.17	30.12	18.7	20.3	24.7	24.7
			27.57		30.32		21.4		24.9	
			30.04		33.34		22.6		26.7	
20190821	8	9.40	28.63	29.73	32.97	33.19	21.1	22.3	26.3	26.5
			30.52		33.25		23.2		26.6	
			33.34		37.22		24.7		29.4	
20190822	9	10.84	32.40	33.14	36.62	36.77	23.6	24.4	28.7	28.9
			33.67		36.47		25.0		28.6	
			37.06		41.29		26.4		31.6	
20190823	10	12.94	36.14	36.78	40.30	40.38	25.4	26.1	30.5	30.6
			37.15		39.55		26.5		29.7	
			41.53		45.50		29.2		34.1	
20190824	11	14.94	40.63	41.19	44.20	44.27	28.2	28.8	32.6	32.7
			41.42		43.10		29.0		31.4	
			45.87		50.17		31.7		37.1	
20190825	12	16.92	44.97	45.64	47.77	48.19	30.8	31.5	34.4	34.9
			46.07		46.64		32.0		33.1	
			49.28		52.21		34.6		38.5	
20190826	13	17.68	48.62	49.47	50.30	50.21	33.9	34.8	36.4	36.3
			50.52		48.12		36.0		33.9	

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续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

	n-l- t1		累计 CO	2产生量 (	g/容器)			累计降角	邓率(%)	
日期	时间 (天)	空白	阳性参	比物	M1900	)22-01	阳性参	比物	M1900	)22-01
		平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			53.10		54.33		37.3		39.3	
20190827	14	19.11	53.01	53.43	53.10	52.78	37.2	37.6	37.9	37.6
			54.17		50.92		38.4		35.5	
			56.90		56.60		40.0		40.4	
20190828	15	20.40	56.64	56.93	56.35	55.52	39.7	40.0	40.1	39.2
			57.24		53.62		40.4		37.0	
			60.60		58.89		42.8		41.6	
20190829	16	21.53	60.17	60.42	58.78	57.88	42.4	42.6	41.5	40.5
			60.50		55.98		42.7		38.4	
			63.60		60.89		45.2		42.9	
20190830	17	22.38	63.69	63.59	61.15	60.04	45.3	45.2	43.2	42.0
			63.49		58.07		45.1		39.8	
			66.95		62.61		47.7		43.7	
20190831	18	23.45	66.81	66.67	64.00	62.29	47.5	47.4	45.2	43.3
			66.26		60.25		46.9		41.0	
			70.25		64.17		50.3		44.3	
20190901	19	24.41	70.14	69.72	66.24	64.04	50.1	49.7	46.6	44.2
			68.77		61.70		48.6		41.6	
			73.77		65.51		52.9		44.6	
20190902	20	25.50	73.35	73.07	68.71	65.81	52.5	52.2	48.2	44.9
			72.08		63.20		51.1		42.0	
			76.62		66.46		55.0		44.6	
20190903	21	26.45	76.22	75.91	69.65	66.91	54.6	54.2	48.2	45.1
			74.88		64.61		53.1		42.5	
			79.34		67.87		56.9		45.0	
20190904	22	27.48	78.93	78.59	71.07	68.28	56.4	56.0	48.6	45.5
			77.49		65.89		54.8		42.8	
			81.75		68.60		58.8		45.2	
20190905	23	28.08	80.80	80.81	71.70	69.28	57.8	57.8	48.6	45.9
			79.89		67.54		56.8		44.0	
			84.34		70.12		60.6		45.7	
20190906	24	29.09	82.65	82.88	73.18	70.74	58.7	59.0	49.2	46.4
			81.64		68.93		57.6		44.4	

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# 续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

	n+ t-1		累计 CO	2产生量 (			累计降值	解率(%)		
日期	时间 (天)	空白	阳性参	比物	M1900	)22-01	阳性参	比物	M1900	22-01
		平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			86.77		71.77		61.9		46.2	
20190907	25	30.31	84.89	85.25	75.16	72.34	59.8	60.2	50.0	46.8
			84.08		70.09		59.0		44.3	
			89.04		73.00		63.2		46.4	
20190908	26	31.38	87.23	87.58	76.51	73.75	61.2	61.6	50.3	47.2
			86.48		71.75		60.4		45.0	
			91.35		74.41		64.7		46.9	
20190909	27	32.33	89.15	89.74	77.65	75.26	62.3	62.9	50.5	47.9
			88.73		73.73		61.8		46.2	
			93.31		75.47		66.0		47.2	
20190910	28	33.10	91.00	91.79	78.64	76.49	63.5	64.4	50.8	48.4
			91.06		75.36		63.6		47.1	
			94.96		76.83		67.1		48.0	
20190911	29	33.77	92.84	93.75	80.00	77.82	64.8	65.8	51.5	49.1
			93.46		76.64		65.4		47.8	
			96.87		78.27		68.4		48.8	
20190912	30	34.53	94.74	95.63	81.26	79.23	66.0	67.0	52.1	49.8
			95.29		78.16		66.6		48.6	
			98.77		79.99		69.9		50.2	
20190913	31	34.99	96.30	97.32	82.56	80.69	67.2	68.3	53.0	50.9
			96.88		79.52		67.9		49.6	
			101.21		82.41		71.5		51.7	
20190914	32	36.04	98.26	99.48	83.84	82.40	68.2	69.6	53.3	51.7
			98.97		80.95		69.0		50.1	
			102.87		83.99		72.3		52.5	
20190915	33	36.94	100.07	101.21	85.07	83.74	69.2	70.5	53.7	52.2
			100.68		82.17		69.9		50.4	
			104.34		85.66		73.2		53.6	
20190916	34	37.54	101.70	102.78	86.37	85.15	70.4	71.5	54.4	53.0
			102.31		83.42		71.0		51.1	
			105.86		87.05		74.0		54.3	
20190917	35	38.33	102.87	104.34	87.56	86.38	70.8	72.4	54.9	53.6
			104.30		84.52		72.3		51.5	

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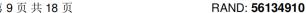
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# 续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

	n4 /1		累计 CO	2产生量 (	g/容器)			累计降值	解率(%)	
日期	时间 (天)	空白	阳性参	比物	M1900	022-01	阳性参	比物	M1900	22-01
		平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			107.05		88.66		74.6		55.4	
20190918	36	38.99	104.25	105.69	89.28	87.98	71.6	73.1	56.1	54.6
			105.77		85.99		73.2		52.4	
			108.70		90.42		75.5		56.4	
20190919	37	39.82	105.35	107.11	90.89	89.62	71.9	73.8	56.9	55.5
			107.29		87.56		74.0		53.2	
			110.22		92.23		76.4		57.6	
20190920	38	40.54	106.81	108.62	92.85	91.44	72.7	74.7	58.3	56.7
			108.83		89.25		74.9		54.3	
			112.00		93.92		77.3		58.4	
20190921	39	41.54	108.31	110.28	94.74	93.20	73.2	75.4	59.3	57.6
			110.53		90.95		75.6		55.1	
			113.26		95.46		77.7		59.1	
20190922	40	42.41	109.73	111.67	96.54	94.84	73.8	75.9	60.3	58.4
			112.02		92.52		76.3		55.9	
			114.36		97.14		77.9		60.0	
20190923	41	43.32	111.21	112.98	98.15	96.45	74.4	76.4	61.1	59.2
			113.37		94.05		76.8		56.6	
			115.81		98.62		78.3		60.5	
20190924	42	44.39	112.66	114.42	99.67	97.95	74.9	76.8	61.6	59.7
			114.78		95.55		77.2		57.0	
			116.85		99.89		78.6		61.0	
20190925	43	45.16	113.77	115.60	101.28	99.31	75.2	77.2	62.6	60.4
			116.19		96.77		77.9		57.5	
			118.08		101.32		78.9		61.5	
20190926	44	46.14	114.93	116.87	102.56	100.48	75.4	77.6	62.9	60.6
			117.60		97.56		78.4		57.3	
			119.03		102.56		78.9		61.9	
20190927	45	47.05	115.97	117.98	103.90	101.62	75.6	77.8	63.4	60.8
			118.94		98.40		78.8		57.2	
		_	122.49		105.98		79.5		62.4	
20191001	49	50.03	119.46	121.48	107.46	105.13	76.1	78.4	64.0	61.4
			122.50		101.95		79.5		57.9	

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# 续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

	n4 /a1		累计 CO	2产生量 (	g/容器)			累计降值	解率(%)	
日期	时间 (天)	空白	阳性参	比物	M1900	022-01	阳性参	比物	M1900	22-01
		平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			126.07		109.76		80.4		63.6	
20191004	52	52.71	122.61	124.76	111.33	108.95	76.6	79.0	65.4	62.7
			125.60		105.76		79.9	1	59.1	
			129.13		112.91		80.5		63.8	
20191008	56	55.71	125.90	127.94	115.07	112.40	77.0	79.2	66.2	63.2
			128.78		109.22		80.1		59.7	
			131.86		117.34		81.2		66.4	
20191011	59	57.81	128.42	130.62	119.47	116.80	77.4	79.8	68.7	65.8
			131.57		113.59		80.9		62.2	
			135.06		120.52		82.3		67.4	
20191015	63	60.03	131.28	133.64	122.87	125.38	78.1	80.7	70.1	66.8
			134.59		116.56		81.8		63.0	
			137.31		123.13		82.9		68.5	
20191018	66	61.67	133.64	135.88	125.49	122.62	78.9	81.3	71.1	67.9
			136.68		119.24		82.2	1	64.2	
			140.23		125.85		83.2		68.5	
20191022	70	64.38	136.67	138.84	128.25	125.38	79.3	81.7	71.2	68.0
			139.63		122.03		82.5		64.3	
			142.57		128.01		83.6		68.8	
20191025	73	66.31	139.08	141.23	130.37	127.54	79.8	82.1	71.4	68.3
			142.03		124.24		83.0		64.6	
			145.52		130.27		84.6		69.0	
20191028	76	68.37	142.03	144.18	132.57	129.76	80.8	83.1	71.6	68.4
			144.99		126.44		84.0		64.7	
			147.08		132.16		84.7		69.4	
20191029	77	69.87	143.56	145.72	134.47	131.64	80.8	83.2	72.0	68.8
			146.51		128.29		84.0		65.1	
			148.96		134.14		85.4		70.3	
20191101	80	71.07	145.36	147.58	136.40	133.59	81.5	83.9	72.8	69.7
			148.41		130.22		84.8		65.9	
			152.16		136.41		86.3		70.2	
20191105	84	73.42	148.56	150.77	138.68	135.93	82.4	84.8	72.8	69.7
			151.60		132.70		85.7		66.1	

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# 续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

	n4 /a1		累计 CO	2产生量(	g/容器)			累计降值	解率(%)	
日期	时间 (天)	空白	阳性参	比物	M1900	022-01	阳性参	比物	M1900	22-01
		平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			154.17		139.07		86.9		71.5	
20191108	87	74.91	150.68	152.86	140.34	137.93	83.1	85.5	72.9	70.2
			153.74		134.38		86.4	1	66.3	
			156.68		141.92		87.8		72.8	
20191112	91	76.58	153.20	155.35	142.25	140.19	84.0	86.4	73.2	70.9
			156.17		136.39		87.3	1	66.7	
			158.44		143.77		88.4		73.5	
20191114	93	77.83	155.07	157.22	143.61	141.76	84.7	87.1	73.3	71.3
			158.15		137.90		88.1	]	67.1	
			160.49		145.82		89.1		74.2	
20191119	98	79.24	156.93	159.23	145.18	143.47	85.2	87.7	73.5	71.6
			160.27		139.41		88.8	1	67.1	
			162.06		147.31		89.4		74.5	
20191122	101	80.50	158.55	160.84	146.56	144.90	85.6	88.1	73.6	71.8
			161.91		140.83		89.3		67.3	
			163.84		148.90		89.8		74.6	
20191126	105	81.97	160.28	162.56	148.11	146.48	85.9	88.4	73.7	71.9
			163.55		142.44		89.5	]	67.4	
			165.33		150.05		90.1		74.6	
20191128	107	83.12	161.68	163.91	149.29	147.65	86.1	88.6	73.8	71.9
			164.71		143.60		89.5		67.4	
			167.04		151.74		90.5		75.0	
20191203	112	84.50	163.35	165.58	151.68	149.51	86.5	88.9	74.9	72.5
			166.35		145.11		89.7		67.6	
			168.30		153.07		90.7		75.3	
20191206	115	85.54	164.56	166.82	152.94	150.84	86.6	89.1	75.1	72.8
			167.59		146.52		90.0		68.0	
			169.56		154.40		91.1		75.7	
20191210	119	86.50	165.63	167.98	154.07	152.07	86.8	89.4	75.3	73.1
			168.76	<u></u>	147.75		90.2		68.3	
			171.01		155.69		91.4		75.8	
20191213	122	87.68	166.94	169.36	155.45	153.41	86.9	89.6	75.6	73.3
			170.14		149.10		90.4		68.5	

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# 续表 2 检测过程中累计二氧化碳产生量及生物分解百分率

	n4 /ar		累计 CO	2产生量(	g/容器)			累计降	解率(%)	
日期	时间 (天)	空白	阳性参	比物	M1900	)22-01	阳性参	比物	M1900	22-01
		平均	(CO <sub>2</sub> ) <sub>Cp</sub>	平均	(CO <sub>2</sub> ) <sub>M</sub>	平均	Dp%	平均	Ом%	平均
			172.31		156.91		91.4		75.8	
20191217	126	88.91	168.23	170.65	156.72	154.62	87.0	89.6	75.6	73.3
			171.42		150.23		90.5		68.4	
			173.54		158.13		91.7		76.0	
20191220	129	89.93	169.38	171.85	157.99	155.89	87.1	89.8	75.9	73.5
			172.63		151.55		90.7		68.7	
			175.12		159.83		91.9		76.4	
20191224	133	91.34	170.94	173.40	159.75	157.61	87.3	90.0	76.3	73.9
			174.14		153.24		90.8		69.0	
			176.68		161.32		92.0		76.4	
20191227	136	92.75	172.51	174.98	161.20	159.06	87.5	90.2	76.3	73.9
			175.75		154.67		91.0		69.0	
			178.15		162.91		92.4		76.9	
20191231	140	93.92	174.42	176.67	162.42	160.56	88.3	90.8	76.4	74.3
			177.44		156.36		91.6		69.6	
			179.34		164.13		92.5		77.1	
20200103	143	95.00	175.67	177.87	163.87	161.93	88.5	90.9	76.8	74.6
			178.60		157.79		91.7		70.0	
			180.87		165.09		93.1		77.1	
20200107	147	95.92	177.27	179.44	165.23	163.12	89.2	91.6	77.3	74.9
			180.17		159.04		92.4		70.4	
			182.32		166.43		93.6		77.5	
20200110	150	96.92	178.66	180.86	166.59	164.53	89.6	92.0	77.7	75.4
			181.61		160.57		92.9		71.0	
			183.41		167.72		0.0		77.8	
20200114	154	97.94	180.04	182.10	167.89	165.87	90.0	92.3	78.0	75.7
			182.86		162.00		93.1		71.4	

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7.3 试样及参比材料的时间-累计二氧化碳产生量曲线图

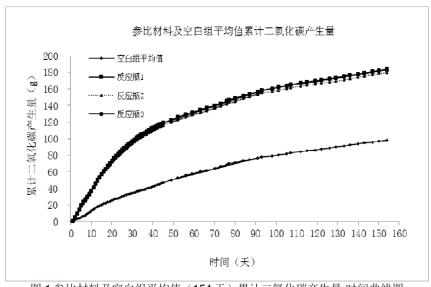


图 1 参比材料及空白组平均值(154 天)累计二氧化碳产生量-时间曲线图

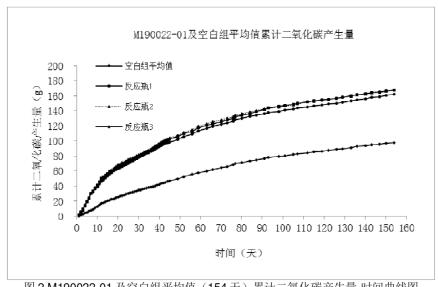


图 2 M190022-01 及空白组平均值(154天)累计二氧化碳产生量-时间曲线图

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# 7.4 试样及参比材料的时间-生物分解百分率曲线图

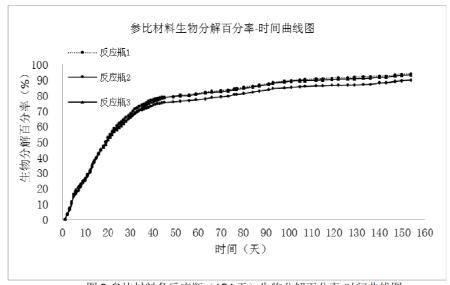


图 3 参比材料各反应瓶(154天)生物分解百分率-时间曲线图

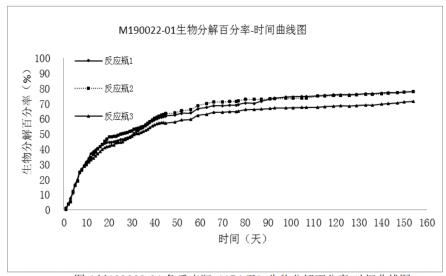


图 4 M190022-01 各反应瓶(154天)生物分解百分率-时间曲线图

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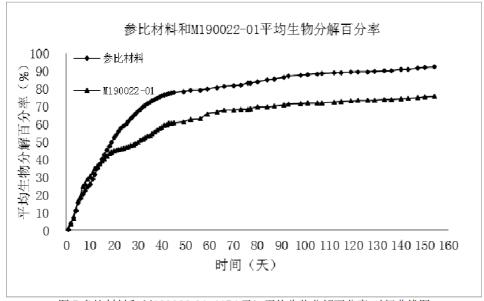


图 5 参比材料和 M190022-01 (154 天) 平均生物分解百分率-时间曲线图

### 7.5 结果

- (1) 参比材料 3 个反应瓶在试验结束时(第 154 天)的生物分解百分率分别为: 93.7%, 90.0%和 93.1%, 平均值为: 92.3%; 3 个反应瓶的生物分解百分率相对偏差分别为 1.5%, 2.5%和 0.9%; 均不大于 20%。
- (2)测试样品 3 个反应瓶在试验结束时(第 154 天)的生物分解百分率分别为: 77.8%、78.0%和71.4%; 平均生物分解百分率为: 75.7%; 3 个反应瓶的生物分解百分率相对偏差分别为 2.8%, 3.0%和5.7%; 均不大于 20%。

# 8 质量控制

- 8.1 试验前 10d 内空白容器产生的二氧化碳量的平均值为: 130.2mgCO<sub>2</sub>/g 挥发性固体,在 50mg-150mgCO<sub>2</sub>/g 挥发性固体范围内。
- 8.2 在试验结束时参比材料和检测样品每个堆肥容器的生物分解百分率之间的相对偏差不超过 20%。
- 8.3 试验第 45d 参比材料容器的平均生物降解百分率为: 77.8%, 大于 70%。

# 9 研究依据

GB/T 19277.1-2011 /ISO 14855-1:2005 受控堆肥条件下材料最终需氧生物分解能力的测定 采用测定释放的二氧化碳的方法 第 1 部分:通用方法

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附图: 试验照片(色差说明: 因拍摄光线及电脑显示器的差异,样品与图片存在色差。)



图 6 试验前 M190022-01 的照片



图 7 试验前 M190022-01 与堆肥混合后的照片(样品组反应容器 1)

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图 8 试验后(第 154 天) M190022-01 与堆肥混合的照片(样品组反应容器 1)

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