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**Modified ASTM D5511**  
**Determining anaerobic biodegradation of plastic**  
**materials under high solids anaerobic digestion conditions**

**Inoculum Source:**

- Organic Compost –New Milford Farms, New Milford, CT
  - ❖ Mattabasset Waste Treatment Facility Anaerobic Digestion
  - ❖ Solid Content 51.55%
  - ❖ pH 7.5
  - ❖ Volatile Fatty Acids 0.7 g/kg
  - ❖ Ammonia Nitrogen 1.2 mg/kg
  - ❖ Volatile Solids 24.9 %

**Procedure:**

1. Three weighed replicates of the test material, provided by the Gilman Brothers Co. were prepared by placing them into 1000 grams of inoculum in containers which were then attached to the gas measuring devices. Incubation temperatures of  $52 \pm 2^{\circ}\text{C}$  were maintained by placing the containers in temperature controlled incubators.
2. Three blanks containing only inoculum, were prepared as described in (1) above, as were three positive controls each containing 20 grams of thin layer grade cellulose. Three negative controls were also run utilizing untreated samples supplied by PAPALIX.
3. Samples were incubated for fifteen days in the dark, or at times, diffused light. Daily, gas volumes were determined. Carbon Dioxide and Methane concentration were also determined. Temperature and room atmosphere pressures were monitored during the course of incubation.



## Theoretical Gas Production

<b>Samples</b>	<b>Carbon Content (grams)</b>	<b>Methane (grams)</b>	<b>Carbon Dioxide (grams)</b>
<b>Sample #1</b> Biodegradable Polycarbonate Indicative Security Seal with Ecopure (5grams)	4.03	5.37	14.78
<b>Negative Control</b> Polyethylene Plastic (5 grams)	8.56	13.36	31.6
<b>Positive Control</b> Cellulose (20 grams)	8.8	11.8	32.3



## Gas Production Data – Samples (Average of 3)

	Biodegradable Polycarbonate Indicative Security Seal with Ecopure		
	A	B	C
1	96	96	80
2	96	96	80
3	33	35	43
4	33	35	43
5	33	35	43
6	33	35	43
7	72	138	86
8	72	138	86
9	72	138	86
10	125	113	175
11	125	113	175
12	125	113	175
13	125	113	175
14	342	171	112
15	342	171	112
<b>Totals 1-15</b>	<b>1724</b>	<b>1540</b>	<b>1514</b>
<b>Averages 1-15</b>	<b>1592</b>		

## Methane and Carbon Dioxide Readings (Average of 3) (%)

	Biodegradable Polycarbonate Indicative Security Seal with Ecopure	
	Methane %	Carbon Dioxide %
04/14/2016	16.3 %	10.3 %
04/21/2016	18.7 %	8.5 %
04/27/2016	30 %	16.5 %
<b>Averages</b>	<b>21.7 %</b>	<b>11.8 %</b>



## Gas Production Data – Controls (Average of 3)

	Negative Polyethylene Plastic			Positive Control Cellulose			Inoculum Control		
	A	B	C	A	B	C	A	B	C
1	272	272	202	1414	1667	1414	202	202	267
2	272	272	202	1414	1667	1414	202	202	267
3	33	74	64	1119	1001	975	59	51	64
4	33	74	64	1119	1001	975	59	51	64
5	33	74	64	1119	1001	975	59	51	64
6	33	74	64	1119	1001	975	59	51	64
7	10	44	27	1139	1312	1035	17	24	34
8	10	44	27	1139	1312	1035	17	24	34
9	10	44	27	1139	1312	1035	17	24	34
10	32	22	27	954	1206	929	25	32	12
11	32	22	27	954	1206	929	25	32	12
12	32	22	27	954	1206	929	25	32	12
13	32	22	27	954	1206	929	25	32	12
14	63	97	83	636	862	783	48	10	44
15	63	97	83	636	862	783	48	10	44
<b>Totals 1-15</b>	<b>960</b>	<b>1254</b>	<b>1015</b>	<b>15809</b>	<b>17822</b>	<b>15115</b>	<b>887</b>	<b>828</b>	<b>1028</b>
<b>Averages 1-15</b>	<b>1,076</b>			<b>16,249</b>			<b>914</b>		

## Methane and Carbon Dioxide Readings (Average of 3) (%)

	Negative Polyethylene Plastic		Positive Control Cellulose		Inoculum Control	
	Methane	Carbon Dioxide	Methane	Carbon Dioxide	Methane	Carbon Dioxide
<b>04/14/2016</b>	9.3 %	9.6 %	49 %	32.7 %	16.3 %	8.9 %
<b>04/21/2016</b>	11.7 %	9.4 %	55.7 %	31.6 %	14 %	9.1 %
<b>04/27/2016</b>	12 %	10.4 %	41 %	36.3 %	18 %	11.2 %
<b>Averages</b>	<b>11 %</b>	<b>9.8 %</b>	<b>48.6 %</b>	<b>33.5 %</b>	<b>16.1 %</b>	<b>9.7 %</b>



## Calculations of Results

Sample:	Average	Average	Methane			Carbon Dioxide			Total CH <sub>4</sub> + CO <sub>2</sub>	Sample-Inoculum=
	Weight	Gas Vol.	(%)	(mL)	(Wt)	(%)	(mL)	(Wt)		
	grams	(mL)			C			C		
Biodegradable Polycarbonate Indicative Security Seal with Ecopure	5	1592	21.7	346	0.19 (grams)	11.7	186	0.10 (grams)	0.29	0.11
Negative Polyethylene Plastic	5	1,076	11	118	0.06	9.8	106	0.06	0.12	0
Positive Control (Cellulose)	20	16,249	48.6	7,897	4.23	33.5	5,443	2.92	7.15	6.97
Inoculum Control	1000	914	16.1	147	0.08	9.7	89	0.05	0.18	

## Calculations of Results

### Results (Average of 3)

	Gaseous Carbon Recovered	Theoretical Grams	(%) Biodegradation Days 1-15
Biodegradable Polycarbonate Indicative Security Seal with Ecopure	0.11	4.03	2.73 %
Negative Polyethylene Plastic	0	8.56	0 %
Positive Control (Cellulose)	6.97	8.8	79.2 %

Approved  
by: \_\_\_\_\_

**Alan Johnson**  
Laboratory Director