ASTM D5511-12 - Anaerobic High Solids Biodegradability - 0526220722A
To: Green Packaging Technology Co., Ltd. (Jiangsu) (License #: 913204120727284980)
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ASTM D5511-12 - 厌氧高固体生物降解性 - 052622072A
致：格域新材料科技（江苏）有限公司（许可证号：913204120727284980）
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Regarding: 159 week study of the Green Packaging Technology Co., Ltd. Clear Film Sample - ERL#2229.
关于：格域新材料科技（江苏）有限公司 159 周的透明复合薄膜样品的研究 - ERL#2229。

RESULTS： Thermophilic study for biodegradation, during a 159 week period, of two TekPak BioFoil Clear samples resulted in 94.1% biodegradation.
结果：在 159 周的时间内，对两个泰克生物油透明薄膜样品进行了嗜热生物降解研究，生物降解率为 94.1%

METHOD： The degree and rate of anaerobic biodegradability of a plastic type material may be predictive of the period required to reduce the proposed plastic from the environment depending on the given conditions. Where disposal is considered a major issue, this method may be useful to estimate the degree and persistence of biodegradable plastic in a biologically active anaerobic disposal situation. As stated in ASTM D5511, this method may also resemble some conditions in biologically active landfills where the gas generated is recovered and biogas production is actively promoted by inoculation (for example, of anaerobic sewage sludge, anaerobic leachate recirculation), moisture control (for example, leachate recirculation), and temperature control (for example, short-term injection of oxygen, heating of recirculated leachate)
方法：根据给定条件，塑料类材料的厌氧生物降解程度和速率可以预测从环境中减少拟议塑料所需的时间。当处理被视为主要问题时，该方法可能有助于估计生物活性厌氧处理情况下可生物降解塑料的程度和持久性。如 ASTM D5511 所述，该方法也可能类似于生物活性垃圾填埋场中的某些条件，其中产生的气体被回收，沼气生产通过接种（例如，厌氧污水污泥、厌氧渗滤液再循环）、水分控制（例如，渗滤液再循环）积极促进，和温度控制（例如，短期注入氧气，加热再循环渗滤液）

ASTM method D5511-12 determines the degree of anaerobic biodegradation of plastic materials in a high-solids anaerobic condition. The sample is exposed to methanogenic inoculum cultivated from a wastewater treatment facility's anaerobic digesters and post-consumer pretreated household waste. Anaerobic decomposition in this case employs a high solids environment. High solids conditions are usually considered to be greater than 20% solids. The sample conditions remain static.
ASTM 方法 D5511-12 确定了高固体厌氧条件下塑料材料的厌氧生物降解程度。样本暴露于从废水处理设施的厌氧消化器和消费后预处理的生活垃圾中培养的产甲烷接种物。在这种情况下，厌氧分解采用高固体环境。高固体条件通常被视为大于 20%的固体。样本条件保持静态

This method is designed to yield a percentage of conversion of carbon in the sample to carbon in the gaseous form under conditions found in high-solids anaerobic digesters, treating municipal solid waste. This can be validated using change in mass of the original sample. This method is also designed to resemble many conditions in a biologically active landfill. This method is applicable to all plastic materials that are not toxic to microorganisms present in wastewater treatment facility's anaerobic digesters that are operating on household waste.
该方法旨在在处理城市固体废物的高固体厌氧消化器中发现的条件下，将样品中的碳转化为气态碳的百分比。这可以通过原始样品的质量变化来验证。这种方法也被设计成类似于生物活性垃圾填埋场中的许多条件。该方法适用于对生活垃圾处理设施厌氧消化池中存在的微生物无毒的所有塑料材料

ASTM Method D5511 determines the rate and degree of anaerobic biodegradation by measuring the volume of carbon dioxide (CO2) and methane (CH4), or change in mass as a function of time (days) of exposure to anaerobic-digester sludge. This method is considered an accelerated representation with respect to anaerobic environments. Landfill sites that plastics encounter in usual disposal methods are a prime example of this environment.
ASTM 方法 D5511 通过测量二氧化碳（CO2）和甲烷（CH4）的体积或暴露于厌氧消化池污泥的时间（天）的质量变化来确定厌氧生物降解的速率和程度。该方法被视为厌氧环境的加速表示。塑料在通常处理方法中遇到的填埋场就是这种环境的一个主要例子。

INOCULUM

1. Inoculum Characteristics and Preparation
    1. Sludge from Organic Compost – Bernalillo Municipal Compost Facility & Albuquerque Municipal Wastewater Facility
        1. Fifteen day hold period observed @ 53 ± 2°C
        2. Solid Content - 44.8% - The method allows anything greater than 20%
        3. pH - 7.6 - 7.9
        4. Volatile Fatty Acids - 1.1 g/kg
        5. Ammonium Nitrogen 1.0 mg/kg THEORETICAL CARBO

理论碳

Sample	Percent Resin	Percent Carbon	Percent Additive	Percent Carbon	Total
2229	99.0	85.6	1.0	74.2	85.5

接种物

1.接种物特性和制备

1.有机堆肥产生的污泥 - Bernalillo 市政堆肥设施和 Albuquerque Municipal 废水设施

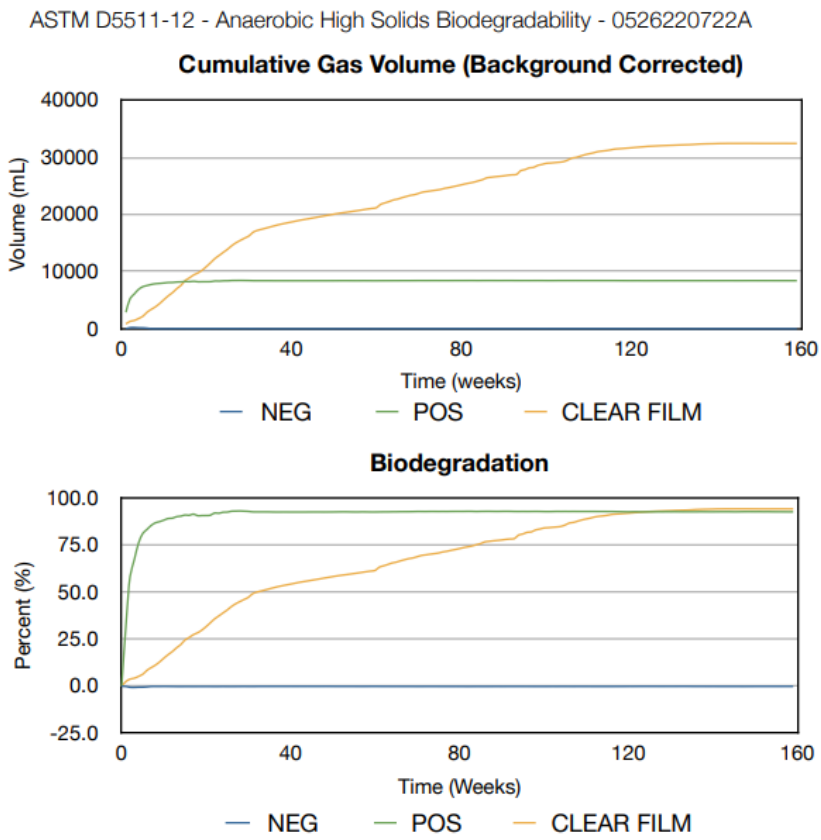
1. 在 53±2°C 下观察到 15 天的保持期
2. 固体含量-44.8% - 该方法允许任何大于 20%的情况
3. pH 值 - 7.6-7.9
4. 挥发性脂肪酸 - 1.1 g/kg
5. 氨氮 1.0 mg/kg 理论碳

数据分析

	Inoculum	Negative	Positive	2229 - CLEAR FILM
Cumulative Gas Volume (mL)	2076.1	2094.6	10497.8	34484.2
Percent CH_4 (%)	44.1	44.1	38.6	52.6
Volume CH_4 (mL)	914.7	924.0	4051.9	18154.9
Mass CH_4 (g)	0.65	0.66	2.89	12.97
Percent CO_2 (%)	38.0	37.0	47.1	39.4
Volume CO_2 (mL)	788.5	775.7	4946.8	13591.2
Mass CO_2 (g)	1.55	1.52	9.72	26.70
Sample Mass (g)	10	10	10	20.0
Theoretical Sample Mass (g)	0.0	8.6	4.2	17.1
Biodegraded Mass (g)	0.91	0.91	4.82	17.01
Percent Biodegraded (%)		-0.0	92.6	94.1

CONCLUSION： Upon consideration of gas production, it becomes obvious that biodegradation has occurred Green Packaging Technology sample (ERL# 2229). It appears that the sample is exhausted. Considering the characteristics of the sample in this study, the performance and results are good.

结论：考虑到产气量，很明显的格域复合薄膜样品（ERL#2229）发生了生物降解。样本似乎已耗尽。考虑到本研究中样本的特点，性能和结果良好。



Over a 159-week period the Green Packaging Technology Sample indicates about 94% biodegradation. These samples easily surmounted the let down rate of the additive. It is important to note that negative movement in biodegradation is the result of the inoculum outperforming the sample or control or barometric pressure changes creating a vacuum on the inverted water column.

在 159 周的时间内，格域复合薄膜样品的生物降解率达到了 94.1%。这些样品很容易克服添加剂的下降率。值得注意的是，生物降解中的负运动是接种物优于样品或控制或大气压变化在倒置水柱上形成真空的结果。

The positive control has achieved the required 70%+ biodegradation. These samples will go through many biological cycles as they biodegrade. It seems the syntrophic effect of the microbes has been fulfilled for this sample. It is not uncommon for this to take up to 90+ days before the microbial colonies reach a quorum. In this method, temperature and moisture are optimized and these results are not expected in all landfills.

阳性对照已达到所需的 70%+生物降解。这些样品在生物降解过程中会经历许多生物循环。这一样本似乎已经实现了微生物的共生效应。在微生物菌落达到法定数量之前需要 90 多天的时间，这种情况并不罕见。在这种方法中，温度和湿度得到了优化，预计不会在所有垃圾填埋场中得到这些结果。