

ICS 83.080.01



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 19277.2-2013

**Determination of the ultimate aerobic biodegradability of plastic materials under
controlled composting conditions-Method by analysis of evolved carbon dioxide-Part
2:Gravimetric measurement of carbon dioxide evolved in a laboratory-scale test**

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2部分：用重量分析法测定实验室条件下二氧化碳的释放量

(English Translation)

Issued on: September 6, 2013

Implemented on: January 31, 2014

Issued by: SAMR; SAC

Table of Contents

Foreword	1
Introduction	2
Scope	3
Normative references	4
Terms and definitions	5
Principle	6
Reagent	7
Instruments	8
Gas supply system	9
Compost container	10
Analytical instrument for the determination of carbon dioxide	11
Airtight tube	12
PH meter	13
Analytical equipment	14
Balance	15
Thermostatic control unit	16
Compost bioreactor	17
Preparation of inoculum	18
Preparing the sea sand	19
Preparation of test materials and reference materials	20
Start the test	21
Determination of carbon dioxide emissions	22
Inoculation stage	23
Termination of the test	24
Theoretical release of carbon dioxide from test materials	25
Percentage of biodegradation	26
Results representation and explanation	27

Foreword

GB/T 19277 "Determination of the final aerobic biodegradability of materials under controlled composting conditions using the method of determining the released carbon

dioxide the Law is divided into the following sections.

--- Part 1. General method;

--- Part 2. Determination of carbon dioxide emissions under laboratory conditions by gravimetric analysis.

This part is the second part of GB/T 19277.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This section uses the translation method equivalent to the ISO 14855-2:2007 "measurement of the final aerobic biodegradability of materials under controlled composting conditions" Methods of determining the release of carbon dioxide - Part 2. Determination of carbon dioxide release under laboratory conditions by gravimetric method the amount".

The documents of our country that have a consistent correspondence with the international documents referenced in this part are as follows.

---GB/T 19277.1-2011 Determination of the final aerobic biodegradability of materials under controlled composting conditions Methods of carbon dioxide Part 1. General methods (ISO 14855-1:2005, IDT).

This part is under the jurisdiction of the National Biomaterials and Degradation Products Standardization Technical Committee (SAC/TC380).

This section drafted by. Suzhou Hanfeng New Materials Co., Ltd., Beijing Technology and Business University Light Industrial Plastics Processing Application Research Institute, Shenzhen City Dajie Plastic Products Co., Ltd., National Plastic Products Quality Supervision and Inspection Center (Beijing).

Introduction

Waste plastics management is a serious problem worldwide. Plastic recycling technology includes material recovery (mechanical recycling, chemical or Crude recovery, biological or organic recovery) and energy recovery (thermal, steam or electrical energy as a substitute for fossil fuels and other fuel resources).

The use of biodegradable plastics is a valuable option for recycling (biological or organic recycling).

Some international standards for measuring the ultimate aerobic/anaerobic biodegradability of plastics have been published. In particular, ISO 14855-1 is adopted the use of continuous infrared analysis, gas chromatography or titration to determine the amount of carbon dioxide released is a common test method. ISO 14855-1:2005 has been equivalently adopted as China's standard GB/T 19277.1-2011. Compared with GB/T 19277.1-2011, this part makes the ratio of compost inoculum to test sample used was 1.10. In order to ensure

the activity of the compost inoculum, inert materials are mixed into the inoculum.

In order to give the mixture the same texture as the soil. The amount of carbon dioxide released from the experimental container is measured by a carbon dioxide absorption device, the absorbent is then subjected to gravimetric analysis. ISO 14855 uses a closed system to collect the released carbon dioxide, which can be determined by isotope calibration Research has obtained useful information, including the way in which the molecular structure of the copolymer is decomposed.

WARNING. Wastewater, activated sludge, soil, and compost may contain potential pathogens, so appropriate precautions should be taken when handling.

Special care must be taken when handling toxicity test compounds or compounds of unknown nature.

Final aerobic organisms under controlled composting conditions Decomposition ability
Method of carbon dioxide Part 2. Weight Analytical method for the determination of carbon dioxide under laboratory conditions Release amount

1 Scope

This part of GB/T 19277 specifies a test method for determining the discharge of a material under controlled composting conditions.

The amount of carbon dioxide is used to determine its ultimate aerobic biodegradability. This method regulates the humidity, aerobic concentration and temperature in the compost container Equal conditions to achieve the best rate of biodegradation.

This section applies to the following materials.

- natural and/or synthetic polymers, copolymers and mixtures thereof;
- Plastics containing additives such as plasticizers and pigments;
- Water soluble polymer;
- Materials that do not inhibit microbial activity in the inoculum under the experimental conditions.

If the test material has an inhibitory effect on the microorganisms in the inoculum, other types of compost or pre-exposure compost can be used.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this

document.

ISO 5663 Water quality-Determination ISO 8245 Water quality-Guidelines for the determination of total organic carbon (TOC) and dissolved organic carbon (DOC) in water quality ISO 14855-1 Determination of the ultimate aerobic biodegradability of materials under controlled composting conditions - Part 1. General method

3 Terms and definitions

The following terms and definitions apply to this document.

Compost

An organic soil conditioner obtained by biological decomposition of the mixture. The mixture consists mainly of plant residues and sometimes some organic materials.

Material and certain inorganic substances.

Composting an aerobic treatment method that produces compost.

Total dry solids A known volume of material or compost is dried to a constant amount of solids at a temperature of 105 °C.

Volatile solid volatilesolids the difference between the total dry solids of a known volume of material or compost minus the amount of residual solids obtained after incineration at a temperature of 550 °C.

Note: The volatile solids content is used to characterize the organic content of the material.

Ultimate aerobic biodegradation Under aerobic conditions, organic compounds are decomposed by microorganisms into carbon dioxide (CO₂), water (H₂O) and mineralized inorganic salts of the elements contained therein.

And new biomass.

Theoretical release of carbon dioxide theoreticalamountofevolvedcarbondioxide $m(\text{ThCO}_2)$ the theoretical maximum value of carbon dioxide that can be generated when the test material is completely oxidized can be calculated from the molecular formula to test per gram or milligram.

The number of milligrams of carbon dioxide released by the material is expressed in mg/g or mg of test material.

Lag phase

From the beginning of the test until the microorganisms adapt (or selected) the decomposition products, and the degree of biodegradation of the test materials has increased to the maximum the number of days required for a biodegradation rate of 10%.

Maximum biological decomposition rate maximumlevelofbiodegradation in the test, the