

Analysis Report

28424/2023.0.FQ

Biodegradability Determination by Titulometry

Commercial Proposal: PC2608/2023.2

Publication date: 10/10/2023

ACCOUNT IDENTIFICATION	
Client: Megh Indústria e Comércio LTDA	CNPJ/CPF: 57.109.241/0001-90
Contact: Ricardo Garcia	Phone: (11) 2065-5555
Address: Avenida Presidente Wilson, 4930 – Vila Independência - São Paulo / SP - ZIPCODE: 04220-001	

SAMPLE No.: 28424-1/2023.0 – MEGHWAX MPO 619 M			
Type of Sample: Raw material			
Receipt Date: 07/31/2023			
Batch: 73659	Manufacturing Date: 07/25/2023	Expiration Date: 07/25/2025	
Sample Quantity: 255 G		Quantity of Packages Received: 1	
Sample Responsibility: Contractor			

Methodology
<p>The Ready Biodegradability test 301 B (OECD, 1997) is a respirometric evaluation method, utilized for non-volatile substances, and evaluates CO₂ evolution. The test has a maximum duration of 28 days and may have its termination earlier if the sample has a 100% Biodegradability level. Three treatments are employed: white, sample and inhibition. The limit of 60% of CO₂ evolution is necessary for easily biodegradable classification if achieved in 10 days, counted from the day in which 10% of CO₂ is obtained. This test was conducted to determine the sample degradation, in a nutrient solution, by a mixed culture of microorganisms derived from the environment. The test is conducted at a controlled temperature of 20 – 25°C. The treatments consisted of white (inoculum only), sample and inhibition. The sample biodegradation was verified through the analysis of CO₂ release among the utilized treatments by Ba (OH)₂ capture and determined by titration with HCl. The test is based on the study of the metabolization of one sample by a mixed culture of microorganisms from the environment. The percentage of released carbon dioxide (CO₂), in relation to the expected theoretical CO₂ total, informs if the sample is biodegradable over a period of time.</p>

Analytical Results				
Physicochemical				
Analysis	Result	Reference	Start Date	End Date
Biodegradability Determination by Titulometry	Biodegradable	POP – FQ 47	10/09/2023	10/10/2023

Notes
<p>The results refer solely and exclusively to the items tested.</p> <p>Reproduction in part of this report is prohibited and reproduction in part requires written approval from Ecolyzer.</p> <p>F-GL 140.00 Analysis Report 1/Approval. 06/12/23</p> <p>Subtitles:</p> <p>NA: Does not apply.</p> <p>LQ: Limit of Quantification.</p>

Sample code: 22501514

TECHNICAL REPORT 22501514 – MARCH 17th 2025

TECHNICAL REPORT COMPLIANT WITH THE STANDARD
OECD 301:1992 Met.B

Test material	
ARCHA sample code	22501514
Producer	MEGH INDUSTRIA E COMÉRCIO Ltda
Material identification	MEGH WAX MPO 619 M
Arrival date	January 28 th 2025

March 17th 2025

LABORATORY ANALYSES TECHNICAL SUPERVISOR

BIODEGRADABILITY & COMPOSTABILITY

CHEMICAL DEPT.

(Dr. Silvia Pierozzi)



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ANNEX 2 – Test report n. 22501514/2

1. INTRODUCTION

This technical note describes the results obtained on the following sample:

Table 1. Test material information and identification.

Test material	
ARCHA sample code	22501514
Producer	MEGH INDUSTRIA E COMÉRCIO Ltda
Material identification	MEGH WAX MPO 619 M
Arrival date	January 28 th 2025

According to the following standard:

- OECD 301:1992 Met.B

to certify the biodegradability of chemicals.

2. PRODUCT CHARACTERIZATION

In Figure 1, the picture of the sample is presented.

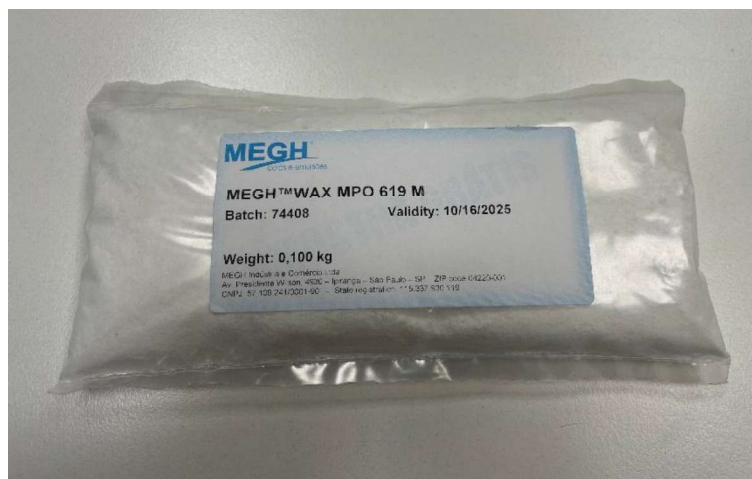


Figure 1. Picture of the sample.

2.1. Initial characterizations

The preliminary analytical characterizations performed were used to quantify the organic carbon content and dry residue.

Table 2. Chemical characterizations of test material.

Parameter	Units of measurement	MEGH WAX MPO 619 M (22501514)
Dry residue	% w/w	99,35
Organic carbon	% w/w d.m.	78,7

3. CHEMICALS – BIODEGRADABILITY ACCORDING TO OECD 301:1992 STANDARD

Method B of the OECD 301:1992 standard investigates the biodegradability of chemical products by determining the CO₂ produced by the biological degradation of the organic content in a period of 28 days.

The sample is added with an inoculum (activated sludge from municipal wastewater) in an aqueous medium. It is mixed with a salt solution containing the inoculum (this solution must not exceed 30 mg/L of suspended solids) and introduced into a bottle where it is aerated through a porous septum at a controlled temperature of 23°C. These vessels are positioned on a shaking plate. During the test, the carbon dioxide produced is monitored and measured at regular intervals. Blank and positive control (sodium benzoate) tests are conducted in parallel.

The sample is introduced into the biodegradation vessels in quantities to obtain a TOC of 20 mg/L in the final solution. The following biodegradation bottles are used:

- 2 bottles for the test sample
- 2 bottles for the reference material (sodium benzoate – positive control)
- 2 bottles for the blank (only inoculum + salt solution)

3.1. Validity of the test

- The inorganic carbon in the test solution must be less than 5% of the total carbon.
- The total evolution of CO₂ in the blank at the end of the test does not exceed the average value of 40 mg/L. In case of values above 70 mg CO₂/L, the data and experimental technique must be examined critically.
- The difference of the test chemical replicates at the end of the test is less than 20%, and the degradation rate of the reference compound has reached 60% by the 14th day.
- Sample and reference must go from 10% to 60% biodegradation in a 10 day window.

3.2. Data processing

As mentioned above, the sample and the reference were characterized in terms of organic carbon content, in order to be able to calculate the maximum amount of CO₂ that can be developed from the biodegradation process (Th CO₂, in g). This value is considered to be the theoretical 100% biodegradability.

Throughout the test, the concentration of CO₂ produced by the sample, inoculum and reference is determined using an infrared sensor with a measuring range of 0-3000 volumetric ppm. Considering that the flow of air feeding the reactors is 90 ml/min, and the test temperature and pressure are also known, it is possible to calculate the amount of CO₂ produced (in mol/h) by the samples, which is then converted into grams.

The net CO₂ developed in the unit of time by the degradation process of the sodium benzoate and the sample is obtained by subtracting from the respective calculated values, that resulting from the inoculum alone:

$$\text{CO}_2 \text{ net sodium benzoate} = \text{CO}_2 \text{ sodium benzoate} - \text{CO}_2 \text{ inoculum}$$

$$\text{CO}_2 \text{ net sample} = \text{CO}_2 \text{ sample} - \text{CO}_2 \text{ inoculum}$$

The biodegradability percentage of the sodium benzoate and the sample respectively is obtained from the ratio of the cumulative net CO₂ value at the end of the test to the respective Th CO₂ value:

$$\% \text{ biodegradability of sodium benzoate} = \frac{\text{CO2 net sodium benzoate}}{\text{Th CO2 sodium benzoate}} \times 100$$

$$\% \text{ biodegradability of sample} = \frac{\text{CO2 net sample}}{\text{Th CO2 net sample}} \times 100$$

Final result is expressed as average value of biodegradability.

3.3. Results

Table 3 summarises the final absolute biodegradability values of the sodium benzoate and sample at the end of the test.

Table 3. Final values of absolute and relative biodegradability obtained at the end of the test.

Sample	Average Biodegradability (%)
SODIUM BENZOATE	97,9
MEGH WAX MPO 619 M (22501514)	89,4

Figure 2 shows the trends over time of the biodegradability values for sodium benzoate and the sample.

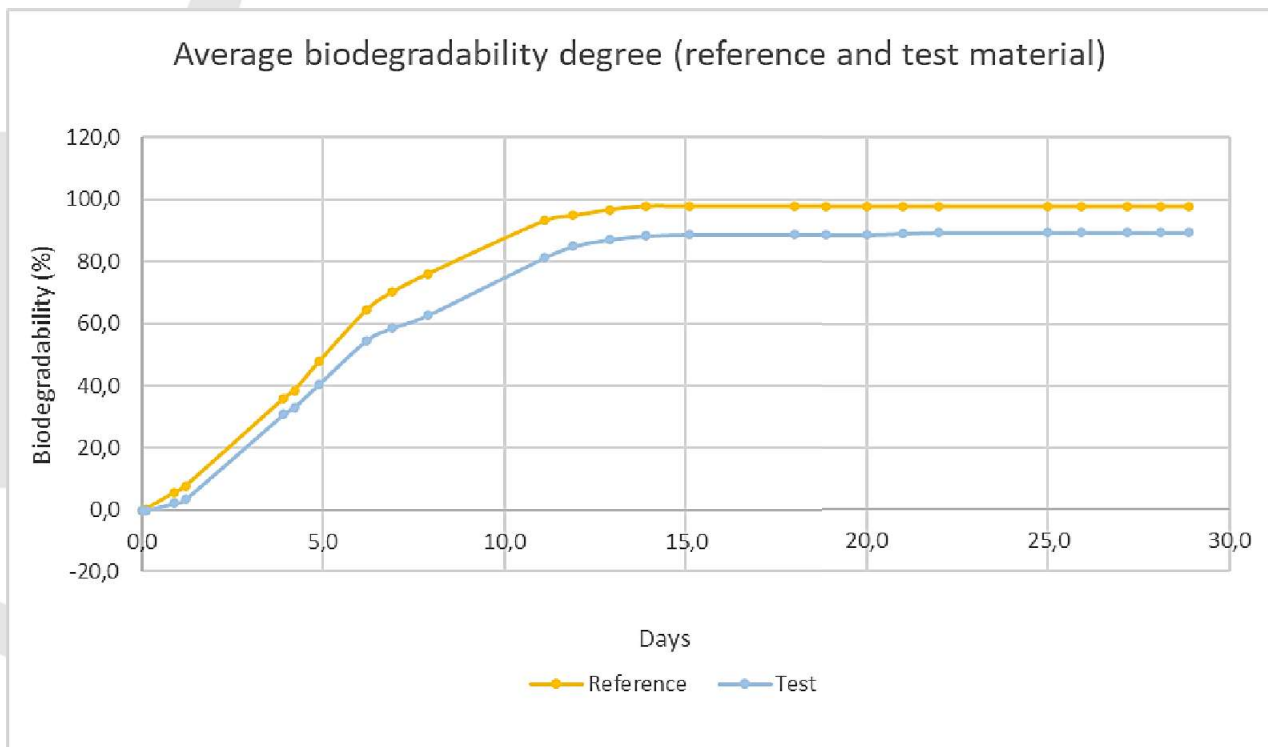


Figure 2. Percentage biodegradability of sodium benzoate and sample over time.

3.4. Conclusion on biodegradability test

The biodegradation test was performed correctly, according to the validity criteria:

- In the test solution the inorganic carbon was less than 5% of the total carbon.
- The total evolution of CO₂ in the blank is less than 40 mg/L: an average value of 37,9 mg/L was obtained.
- The difference of the replicates at the end of the test is less than 20% and the reference compound has reached a biodegradation of 60% in approximately 6 days.
- The sample and reference material went from 10% to 60% biodegradation in approximately 6 days for the sample and 4 days for the reference respectively.

The sample provided an average degree of biodegradation of 89,4%.

ANNEXES

SAMPLE CODE
22501514

ANNEXES 1-2

TEST REPORT

SAMPLES CODE:

22501514/1

22501514/2

Date 17/03/2025

Test Report 22501514/1

MEGH INDUSTRIA E
COMÉRCIO Ltda

Page 1 of 1

MEGH INDUSTRIA E COMÉRCIO Ltda
Registered Office
Av. Presidente Wilson, 4930 – IPIRANGA
BR SÃO PAULO

1. General Data - Sample Description

Description: **MEGH WAX MPO 619 M (MATERIAL CHARACTERIZATION)**
 Sample N°: 22501514/1 Received on: 28/01/2025
 Type of material: PRODUCTS Appearance: SOLID
 Batch N°: -

2. Sampling Data

Site Address: Sede Legale, Av. Presidente Wilson, 4930 – IPIRANGA BR SÃO PAULO
 Sampling Point: Sampling Date: 10/12/2024
 Sampler: Customer Sampling Report:
 Sampling Method:

3. Other Informations

Customer N°: 11785 Order: S24/0234

4. Warnings and Legends

The reproduction of the present Test Report is not allowed without authorization of ARCHA S.r.l.. The content of the present Report refers exclusively to the submitted samples and not to the batch that they want to represent. A portion of the sample is kept for 60 days if the nature and the quantity of the sample allow this. The data and the files are saved in laboratory for ten years. The report is made solely on the basis of the instructions and/or informations and materials supplied by the Applicant. If not indicated on report uncertainty data are available for every single test.

Unless otherwise stated, when they are present: "Description", "Batch N°", "Process conditions", "Sampling date" (if the sample was sampled by the Customer), are data provided by the Customer and the Laboratory disclaims all responsibility.

U = Expanded uncertainty of the test expressed with the same measurement unit as the result and calculated with a coverage factor $k = 2.26$ ($k = 2$ where indicated by the symbol §) corresponding to a probability level of approximately 95% or as a confidence interval calculated at a probability level of approximately 95%; U.M. = Unit of Measurement.

(*) not accredited by ACCREDIA

5. Additional Notes

None

6. Test Results (Start measurements: 28/01/2025 - End measurements: 31/01/2025)

Test	UM	Result	LQ	U	Method Description
TOTAL ORGANIC CARBON	% w/w (d.m.)	78,7		± 9,9	UNI EN 15936:2022 Met B
DRY MATTER	% w/w	99,35		± 0,33	* APHA Standard Methods 2540 G 1997

7. Opinions and interpretations (not to be considered part of the accreditation by ACCREDIA)

None

End of Test Report



Rapporto di Prova firmato digitalmente
Dott. Yuri Pelosi
Ordine dei Chimici della Toscana
N. 1680 SEZIONE A

Date 17/03/2025

Test Report 22501514/2

MEGH INDUSTRIA E
COMÉRCIO Ltda

Page 1 of 2

MEGH INDUSTRIA E COMÉRCIO Ltda
Registered Office
Av. Presidente Wilson, 4930 – IPIRANGA
BR SÃO PAULO

1. General Data - Sample Description

Description: **MEGH WAX MPO 619 M (BIODEGRADABILITY TEST - OECD 301B)**
Sample N°: 22501514/2 Received on: 28/01/2025
Type of material: PRODUCTS Appearance: SOLID
Batch N°: -

2. Sampling Data

Site Address: Sede Legale, Av. Presidente Wilson, 4930 – IPIRANGA BR SÃO PAULO
Sampling Point: Sampling Date: 10/12/2024
Sampler: Customer Sampling Report:
Sampling Method:

3. Other Informations

Customer N°: 11785 Order: S24/0234

4. Warnings and Legends

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Unless otherwise stated, when they are present: "Description", "Batch N°", "Process conditions", "Sampling date" (if the sample was sampled by the Customer), are data provided by the Customer and the Laboratory disclaims all responsibility.

U = Expanded uncertainty of the test expressed with the same measurement unit as the result and calculated with a coverage factor $k = 2.26$ ($k = 2$ where indicated by the symbol §) corresponding to a probability level of approximately 95% or as a confidence interval calculated at a probability level of approximately 95%; U.M. = Unit of Measurement.

(*) not accredited by ACCREDIA

5. Additional Notes

None



Rapporto di Prova firmato digitalmente
Dott. Yuri Pelosi
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N. 1680 SEZIONE A

Date 17/03/2025

Test Report 22501514/2

MEGH INDUSTRIA E
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6. Test Results (Start measurements: 28/01/2025 - End measurements: 07/03/2025)

Test	UM	Result	LQ	U	Method Description
CARATTERIZZAZIONE SOLUZIONE TEST					
TOTAL SUSPENDED SOLIDS	mg/L	20,1		± 3,3	* UNI EN 872:2005
CARATTERIZZAZIONE SOLUZIONE TEST + CAMPIONE					
TOTAL CARBON	mg/L	283			* UNI EN 1484:1999
TOTAL ORGANIC CARBON	mg/L	272			* UNI EN 1484:1999
TOTAL INORGANIC CARBON	mg/L	11,4			* UNI EN 1484:1999
TEST DI BIOGRADABILITA' RIFERIMENTO - SINGOLE PROVE					
BIODEGRADATION DEGREE	%	99,7		± 25,1	OECD Guideline for the testing of chemicals N. 301 1992 Met B
BIODEGRADATION DEGREE	%	96,0		± 24,2	OECD Guideline for the testing of chemicals N. 301 1992 Met B
TEST DI BIOGRADABILITA' RIFERIMENTO - VALORE MEDIO					
BIODEGRADATION DEGREE	%	97,9		± 22,2	OECD Guideline for the testing of chemicals N. 301 1992 Met B
TEST DI BIOGRADABILITA' PRODOTTO - SINGOLE PROVE					
BIODEGRADATION DEGREE	%	90,5		± 22,9	OECD Guideline for the testing of chemicals N. 301 1992 Met B
BIODEGRADATION DEGREE	%	88,2		± 22,4	OECD Guideline for the testing of chemicals N. 301 1992 Met B
TEST DI BIOGRADABILITA' PRODOTTO - VALORE MEDIO					
BIODEGRADATION DEGREE	%	89,4		± 20,3	OECD Guideline for the testing of chemicals N. 301 1992 Met B

The characterization data of the sample tested for biodegradability are given in Test Report No. 22501514/1 of 17/03/2025

The characterization data of reference, Sodium Benzoate (lot 23H314117) are:

- TOC = 54,2 % w/w (determination on 24/09/2024)
- Dry residue = 99,7 % w/w (determination on 24/09/2024)

Activated sludge (used as inoculum for the biodegradability test) was taken on 05/02/2025 from the biological sewage tank of a municipal sewage treatment plant.

The activated sludge sample was transferred to ARCHA in a refrigerated bag and was centrifuged and homogenised for 2 minutes. The supernatant liquid obtained was collected and a nutrient solution was added.

The inoculum thus prepared was left to agitate for about 16 hours at 23 °C for conditioning of the micro-organisms.

The inoculum in the test reactors was added at a concentration of 10 mL/L.

The test product showed sufficient solubility and a solution was prepared at a concentration of 10 g/L, which was then added in aliquots to the salt and inoculum solution.

The test lasted 28 days at a temperature of 23 °C.

The evolution of CO2 produced by the sample and the reference material are reported in the annex.

7. Opinions and interpretations (not to be considered part of the accreditation by ACCREDIA)

None

End of Test Report

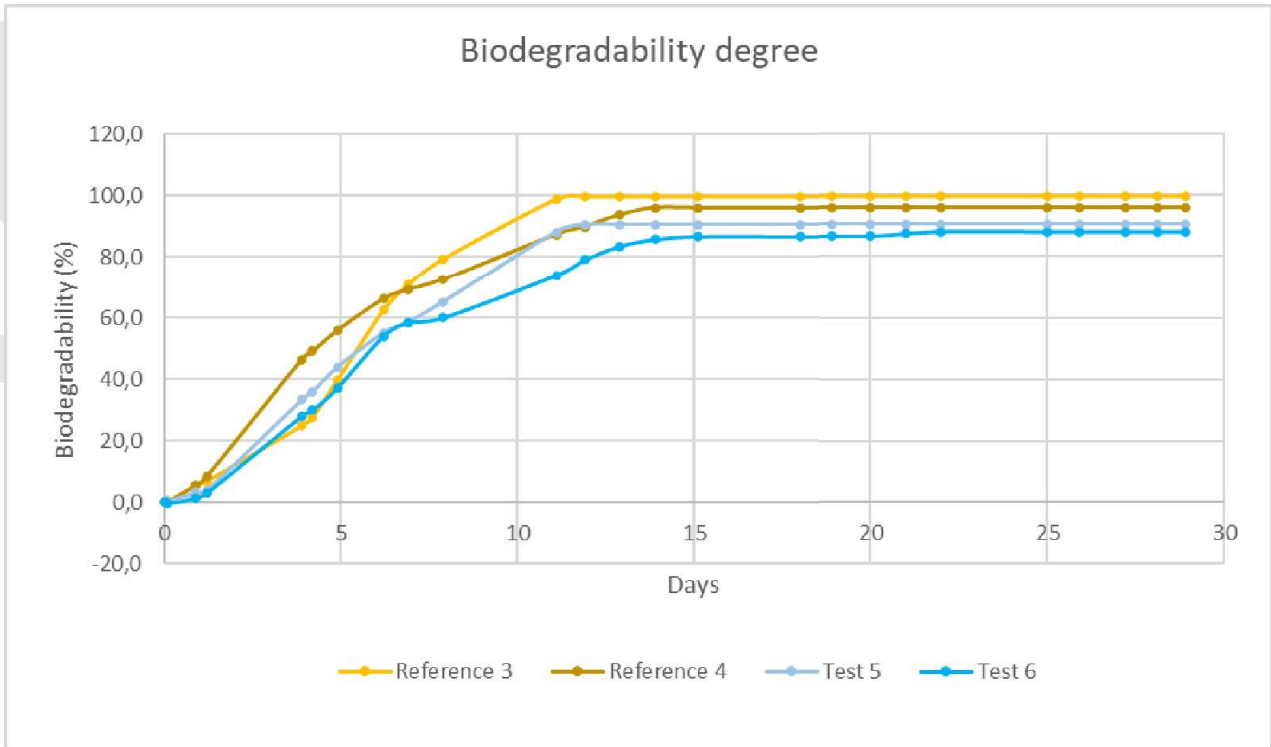


Rapporto di Prova firmato digitalmente
Dott. Yuri Pelosi
Ordine dei Chimici della Toscana
N. 1680 SEZIONE A

Annex to Test Report n. 22501514/2 of 17th March 2025

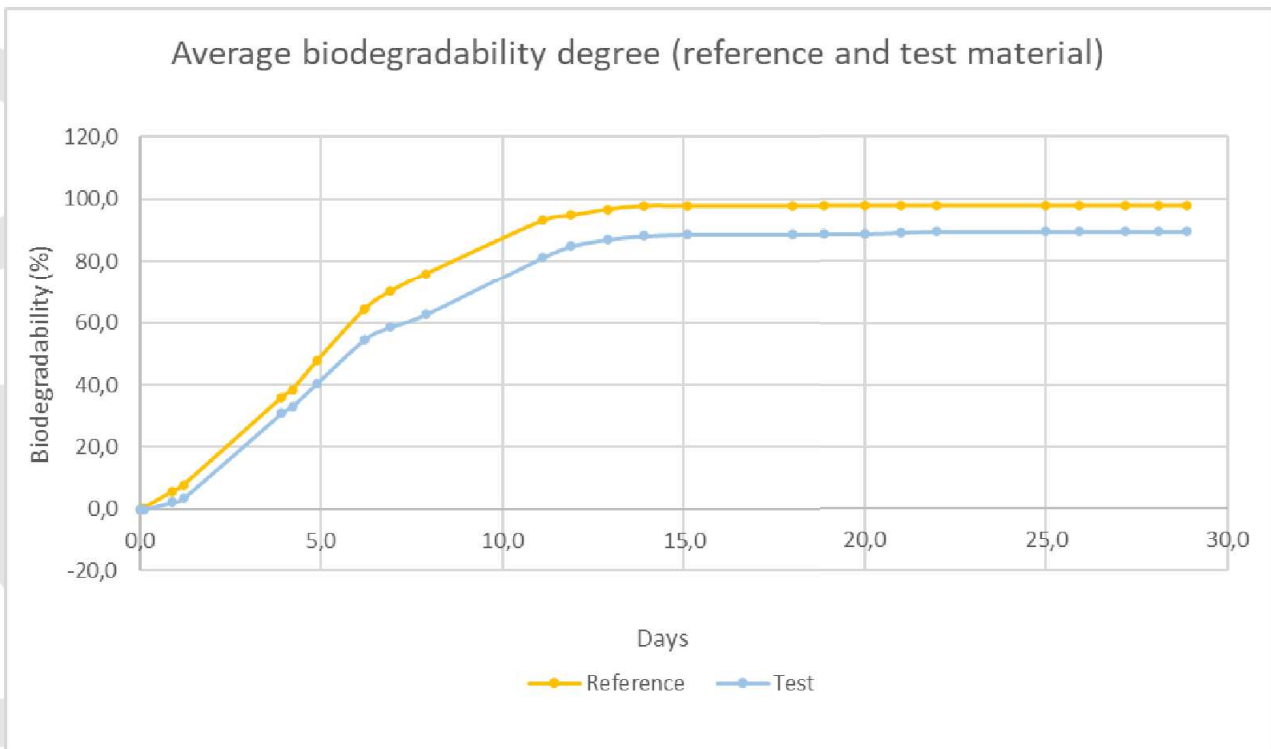
The "OECD Guideline for the testing of chemicals No. 301 1992 Met B" describe the method for determining the biodegradability of chemicals by measuring the CO₂ produced by the biological degradation of the organic content.

Figure 1 shows the biodegradability of the reference benzoate and the sample.



Graph 1. Biodegradation degree for the reference and the sample

Graph 2 shows the trend of the average biodegradability of the reference and sample.



Graph 2. Average biodegradation degree for the reference and the sample

Table 1 shows the raw data of CO₂ developed, in grams, in each reactor (cumulative, not subtracted from the blank) during the biodegradability test.

Table 1. Raw data of CO₂ in grams developed in each reactor (cumulative, not subtracted from blank)

TIME (days)	Blank 1	Blank 2	AVG Blank	Reference 3	Reference 4	AVG reference	Test 5	Test 6	AVG Test
0,0	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
0,1	0,000	0,001	0,000	0,001	0,001	0,001	0,001	0,000	0,001
0,9	0,005	0,008	0,007	0,011	0,011	0,011	0,009	0,008	0,008
1,2	0,006	0,011	0,008	0,013	0,014	0,014	0,011	0,011	0,011
3,9	0,020	0,026	0,023	0,041	0,057	0,049	0,049	0,044	0,047
4,2	0,022	0,027	0,024	0,044	0,060	0,052	0,052	0,047	0,049
4,9	0,026	0,029	0,028	0,057	0,069	0,063	0,062	0,056	0,059
6,2	0,030	0,032	0,031	0,077	0,080	0,078	0,074	0,072	0,073
6,9	0,033	0,034	0,034	0,086	0,085	0,085	0,079	0,078	0,078
7,9	0,035	0,036	0,036	0,094	0,089	0,092	0,087	0,081	0,084
11,1	0,037	0,038	0,038	0,110	0,102	0,106	0,106	0,093	0,100
11,9	0,038	0,038	0,038	0,111	0,104	0,107	0,108	0,097	0,103
12,9	0,038	0,038	0,038	0,111	0,107	0,109	0,108	0,101	0,105
13,9	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,102	0,105
15,2	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,103	0,106
18,0	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,103	0,106
18,9	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,103	0,106

20,0	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,103	0,106
21,0	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106
22,0	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106
25,0	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106
25,9	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106
27,2	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106
28,2	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106
28,9	0,038	0,038	0,038	0,111	0,108	0,110	0,108	0,104	0,106

Table 2 shows the biodegradability percentages for the reference and the sample.

Table 2. Biodegradability percentages

TIME (days)	Reference 3	Reference 4	AVG reference	Test 5	Test 6	AVG Test
0,0	0,00	0,00	0,00	0,00	0,00	0,00
0,1	0,32	0,27	0,30	0,41	-0,29	0,06
0,9	5,63	5,67	5,65	3,25	1,43	2,34
1,2	6,93	8,41	7,67	3,96	3,06	3,51
3,9	25,02	46,50	35,76	33,38	28,12	30,75
4,2	27,67	49,05	38,36	35,98	30,06	33,02
4,9	39,81	55,89	47,85	43,91	37,23	40,57
6,2	62,45	66,16	64,30	55,02	53,95	54,49
6,9	70,77	69,18	69,97	58,46	58,47	58,47
7,9	79,41	72,65	76,03	65,25	60,05	62,65
11,1	98,83	87,34	93,09	88,16	74,01	81,08
11,9	99,68	89,85	94,76	90,54	79,06	84,80
12,9	99,68	93,76	96,72	90,54	83,56	87,05
13,9	99,68	96,03	97,85	90,54	85,77	88,15
15,2	99,68	96,03	97,85	90,54	86,70	88,62
18,0	99,68	96,03	97,85	90,54	86,70	88,62
18,9	99,68	96,03	97,85	90,54	86,70	88,62
20,0	99,68	96,03	97,85	90,54	86,70	88,62
21,0	99,68	96,03	97,85	90,54	87,48	89,01
22,0	99,68	96,03	97,85	90,54	88,19	89,36
25,0	99,68	96,03	97,85	90,54	88,19	89,36
25,9	99,68	96,03	97,85	90,54	88,19	89,36
27,2	99,68	96,03	97,85	90,54	88,19	89,36
28,2	99,68	96,03	97,85	90,54	88,19	89,36
28,9	99,68	96,03	97,85	90,54	88,19	89,36

An analysis of the results obtained is given below:

- The Inorganic Carbon content of the complete solution (salts solution + inoculum + sample) at the beginning of the test was less than 5% of the total carbon and the total evolution of CO₂ in the blank at the end of the test did not exceed the average value of 40 mg/L.
- The difference of the replicates performed on the test substance at the end of the test was less than 20% and the degradation rate of the reference compound reached 60% by day 14.
- The sample and reference have passed from 10% to 60% biodegradation within a 10-day window.

Pisa, 17th March 2025

Head of Chemical Dept.
Dott. Yuri Pelosi.....

