

सिपेट : पेट्रोकेमिकल्स तकनीकी
संस्थान (आई.पी.टी.)

(पूर्व में केंद्रीय प्लास्टिक टेक्नॉलॉजी इंजीनियरिंग एवं तकनीकी संस्थान)

रसायन एवं पेट्रो-रसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
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प्लास्टिक परीक्षण केंद्र / PLASTIC TESTING CENTRE

श्रृंखला:बी / Series : C **ANALYSIS REPORT**

परीक्षण रिपोर्ट / TEST REPORT

क्र.सं / S.L. No.

21504

को जारी / Issued to **BIOGREENIC POLYMERS Pvt. Ltd.**
Plot No. 8, Sai Estate, Block No. 139/140,
Mouje Vasna, Chacharvadi, Sanand,
Ahmedabad-382213

रिपोर्ट सं / Test Report No : 2910
दिनांक / Dated : 16.04.2024
संदर्भ / Your Ref. No. : NIL
दिनांक / Dated : 31.08.2023

As per part C

मानक के अनुसार टेस्ट रिपोर्ट
Test Report as per Standard :

PART A

PARTICULARS OF SAMPLE SUBMITTED

- a) Name of the sample(as stated by the party) : **Compostable Film**
b) Grade/Variety/Type/Size/Class etc. : ---
c) Code No. : ---
d) Quantity (pcs/mtr/gm/nos) : 1.5 kg.
e) Mode of packing : In Sealed Carton
(Sealed carton/poly pouch/container or not)
f) Date of receipt of sample : 31.08.2023
g) Date of Performance of test : 04.10.2023
h) Date of Completion : 16.04.2024
i) Any other information : ---

PART B

SUPPLEMENTARY INFORMATION.

- a) Reference to sampling procedure : Drawn & supplied by the party
b) Supporting documents for Measurements : As per Part C
Taken and results derived like graphs,
Tables, sketches and/or Photographs as
appropriate to test report if any (to be attached)
c) Deviation from the test methods as : Not Applicable
Prescribed in relevant ASTM/ISO/BIS/
Work instructions, if any

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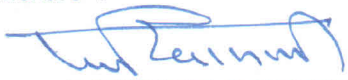
**PART C
TEST RESULTS**

Sr.No	Name of the Test	Test Method/Standard	Unit	Results obtained	Specified Requirements		
Sample Details : Compostable Film (As stated by the party)							
1.	Material Identification	FTIR/DSC	-	Blends of PLA/PBAT	-----		
2	a) Filler Content b) Dry Solid c) Volatile Content	ISO 17088:2021 Cl.3.5 Cl.3.7 Cl.3.9	%	0.74 53.77 38.1	-----		
3	Max. Thickness of Submitted sample	ISO 17088:2021 Cl.6.2.1	micron	38	-----		
	Disintegration (Dry mass passing through 2 mm sieve after 84 days)	ISO 17088:2021 Cl.6.2.1	%	8.7	Not more than 10%		
4	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 17088:2021 Cl.6.3.1	%	92.86	>90 (At the end of the test period not more than 180 days)		
5	Plant growth study- Monocotyledon (Sorghum) % Seed emergence	ISO 17088:2021	%	95	>90		
	Dicotyledon (tomato) % Seed emergence	Cl.6.4.3	%	92	>90		
6.	Acute Ecotoxic effects to earthworm	ISO 17088:2021		100	>90		
a.	Survival adult earthworm at the end of 7 days	Cl.6.4.4	%	98	>90		
b.	Survival adult earthworm at the end of 14 days						
c.	Biomass at the end of 14 days					97.5	>90
7	Chronic Ecotoxic effects to earthworm	ISO 17088:2021		95	>90		
a.	Survival adult earthworm at the end of 28 days	Cl.6.4.5	%	91	>90		
b.	Survival adult earthworm at the end of 56 days						
c.	Biomass at the end of 56 days					92.50	>90
d.	Offspring at the end of 56 days					93	>90

Note: The detailed observation on biodegradability test is enclosed as Annexure -I


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PART C
TEST RESULTS

Sr. no.	Name of the Test	Test Method/Standard	Unit	Results obtained	Specified requirements
7.	Heavy metals concentrations # Arsenic (As) Copper (Cu) Nickel (Ni) Zinc (Zn) Cobalt (Co) Chromium (Cr) Molybdenum (Mo) Mercury (Hg) Cadmium (Cd) Lead (Pb) Selenium (Se)	ISO 17088:2021 C1.6.5.2	mg/l	0.32 8.19 3.08 38.58 0.58 5.11 0.16 B.L.Q(Q.L.=0.05) 0.44 1.22 0.42	20 500 100 2500 ---- 300 ---- 10 20 500 ----

*Based on Municipal waste (Management and Handling) Rules, 1999 notified on 27th September, 1999 by Ministry of Environment and Forests, Government of India. Note that Concentration of Metals like Cobalt, Molybdenum, and Selenium is not mentioned in the notification.

PART D

REMARKS : Nil

Note :

1. This Test Report / Certificate is issued only for the samples submitted to the laboratory.
2. The results stated above related only to the items tested.
3. The quality of the subsequent production lot has to be ensured by the purchaser.
4. This Test Report shall not be reproduced except in full without the written approval of the laboratory.
5. Any anomaly/ discrepancy in this report should be brought to the notice of the laboratory within 30 days from the date of issue.
6. Subcontracted Tests (if any): # Gujarat Laboratory

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Annexure-I

OBSERVATION FOR BIODEGRADABILITY TEST AS PER IS /ISO 17088:2008

Customers Details:

Name of the Party :- BIOGREENIC POLYMERS Pvt. Ltd.

1. Sample Details : Compostable Film (As declared by the party)

2. Material Identification by FTIR & DSC : Blends of poly lactic Acid (PLA)/ Poly Butylene Adipate Co-Terephthalate (PBAT)

3. Observation:-

a) Conditions of reaction mixtures

Origin of Compost : Livestock excreta, municipal and vegetable waste
Reaction Temperature : 58° (±2°C)
CO₂ evolved during 1st 10 days
in blank vessels : 54.4 mg/g of volatile solids of compost
Test Duration : 127 Days.
Reference Material : Cellulose.
Volume of reaction vessel : 3000ml.

b) pH of Test medium

Sl. No.	Composting Vessel	pH (before test)	pH (after test)
1	Blank 1	7.1	7.9
2	Blank 2	7.5	8.1
3	Blank 3	8.0	8.2
4	Cellulose 1	7.6	8.5
5	Cellulose 2	8.1	7.5
6	Cellulose 3	7.5	7.4
7	Negative 1	8.3	7.8
8	Negative 2	8.1	7.3
9	Negative 3	8.0	8.2
10	Sample 1	8.5	8.4
11	Sample 2	8.1	7.8
12	Sample 3	8.2	7.4

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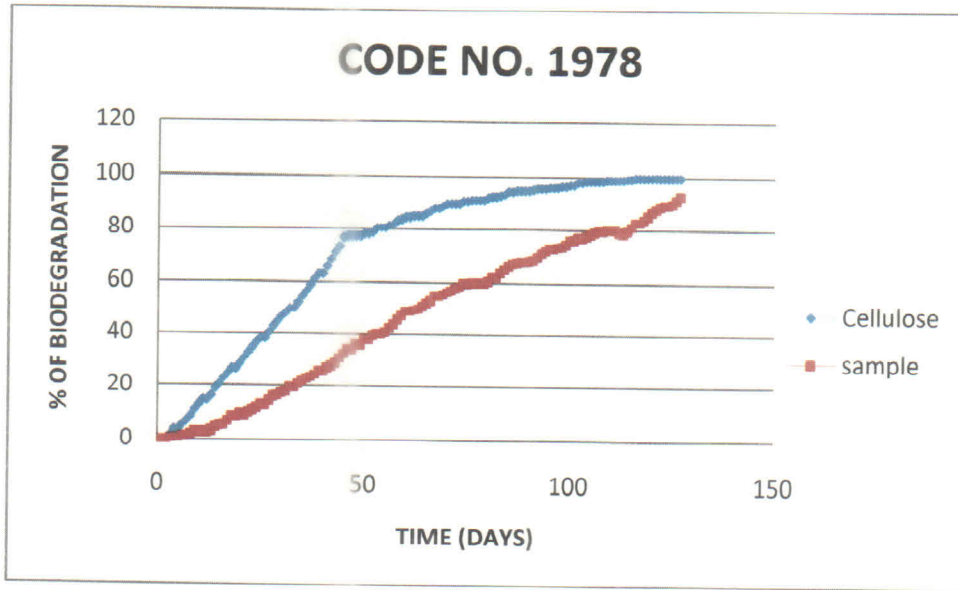
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4. Result : Percentage biodegradation relative to positive reference

MEAN (%) : 92.86 %

The reference material- Cellulose (%) : 100%



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5. Visual Observation of Sample

Description	Week 1	Week 5	Week 10	Week 15	Week 18
Structure	Film sample	Film sample	Film sample	Film sample	Film sample
Moisture	Adequate Moisture level	Adequate Moisture level	Adequate Moisture level	Adequate Moisture level	Adequate Moisture level
Colour	Milky white	Milky white	Milky white	Faded white	---
Fungal Development	Nil	Nil	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

6. Visual Observation of Compost

Description	Week 1	Week 5	Week 10	Week 15	Week 18
Structure	Fine Particles	Fine Particles	Fine Particles	Fine Particles	Fine Particles
Moisture	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level	Adequate moisture level
Colour	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
Fungal Development	Nil	Nil	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like	Organic/dirt like

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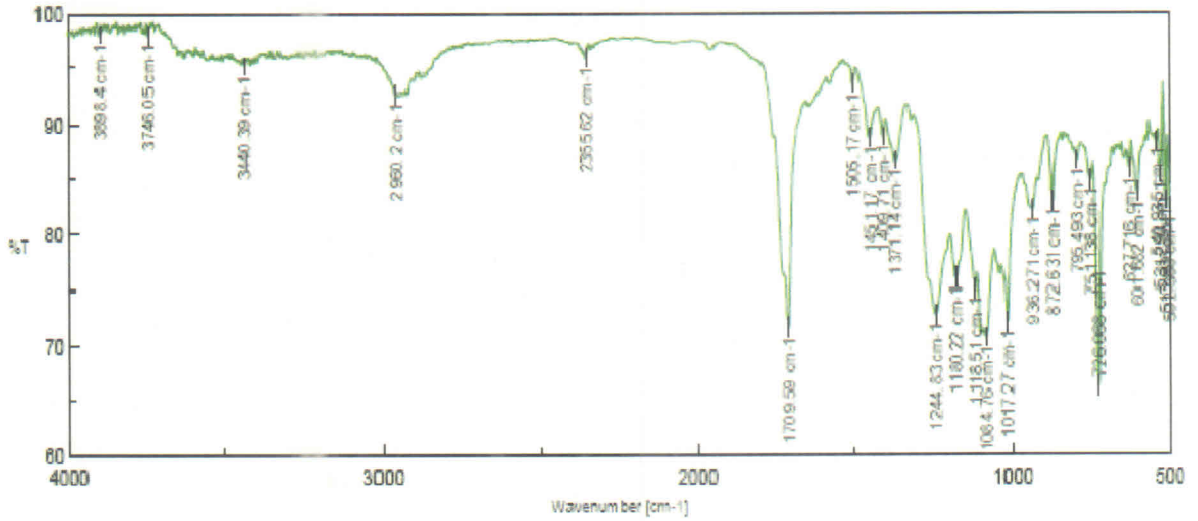
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7. FTIR Analysis

Sample Details : **Compostable Film** (As declared by the party)

BIC 1978 .jws



Wave number (cm ⁻¹)	Nature of Bond
1)2960.2	C - H Stretching vibrations
2)1709.59	C = O Stretching vibrations
3) 1180.22	O - H Bending vibrations
4) 1318.51	O - H Bending vibrations
5) 872.631	C = C Bending vibrations

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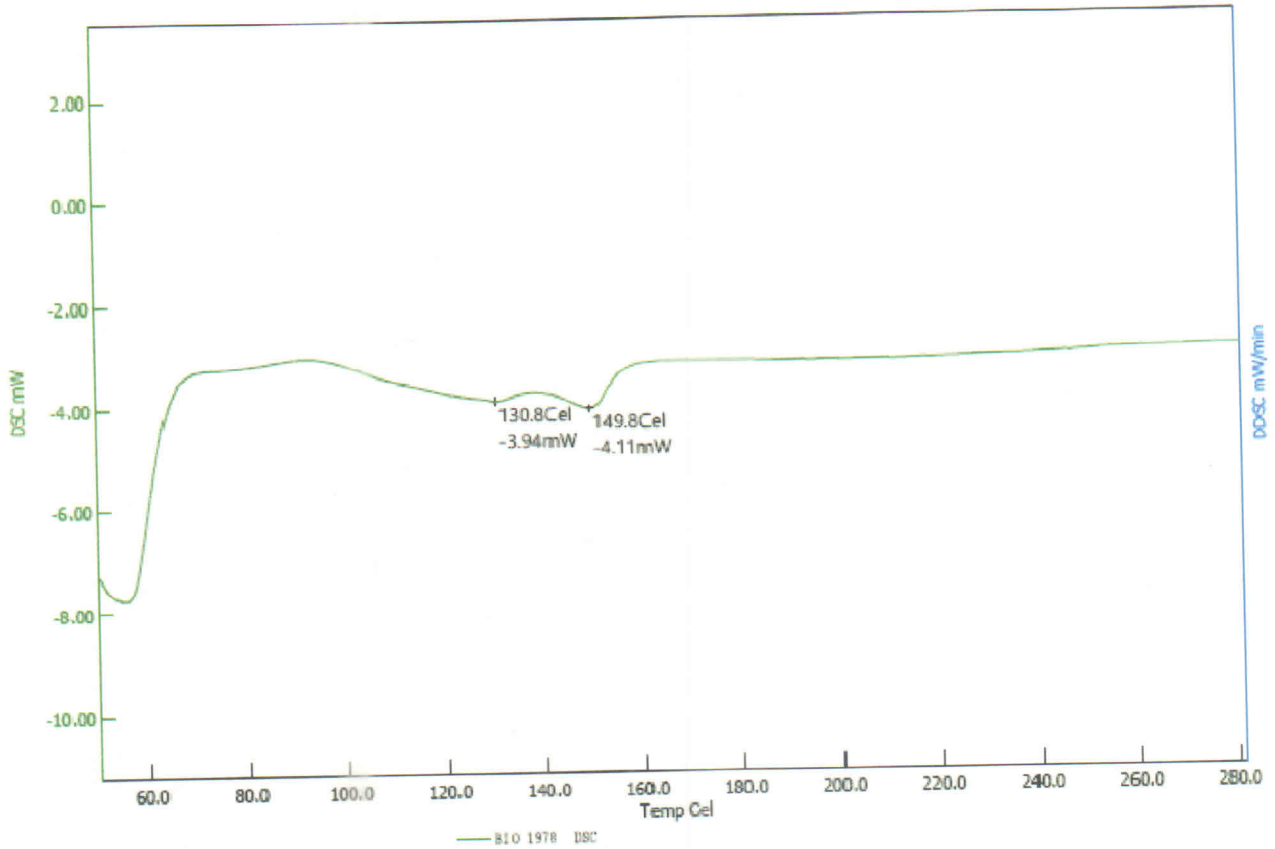
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8. DSC Analysis



Comment: The above FTIR & DSC analysis indicates the above sample is Blends of poly lactic Acid
(PLA)/ Poly Butylene Adipate Co- Terephthalate (PBAT) Compostable Film .

AUTHORISED SIGNATORY

किर्ती डी. त्रिवेदी / Kirti D. Trivedi
तक. अधिकारी / Technical Officer

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सिपेट : पेट्रोकेमिकल्स तकनीकी
संस्थान (आई.पी.टी.)

(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्थान)

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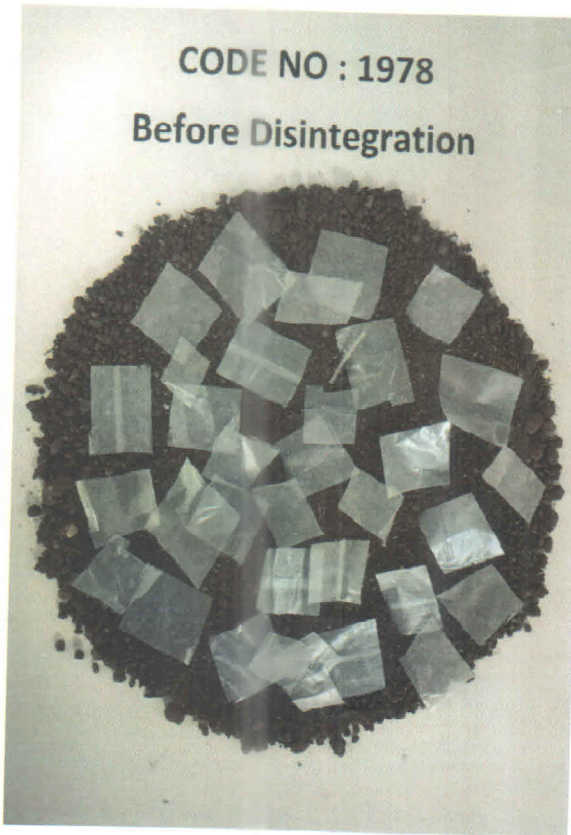
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9. DISINTEGRATION - AFTER 12 WEEKS



BEFORE DISINTEGRATION



AFTER DISINTEGRATION

The disintegration of the sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2021/ISO 17088: 2012 was found not more than 10% of original dry mass remain.

AUTHORISED SIGNATORY

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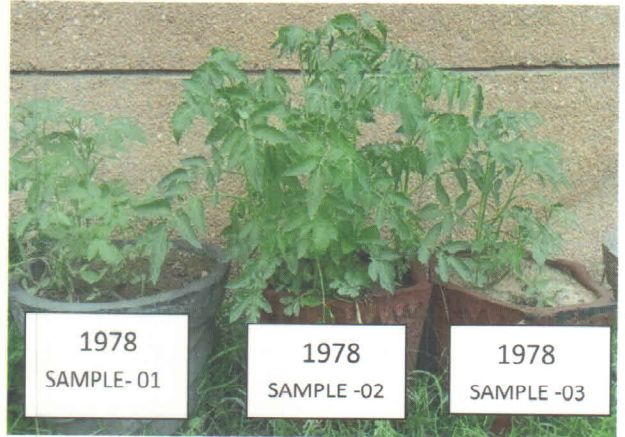
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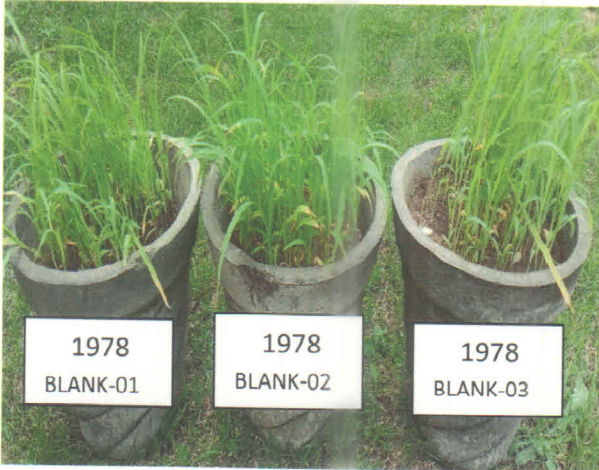
10. GERMINATION AND PLANT GROWTH STUDY



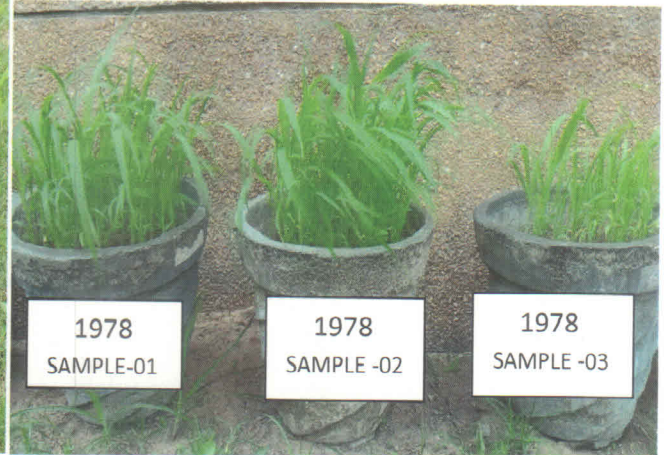
1978 Compost (Control)



1978 Compost (Sample)



1978 Compost (Control)



1978 Compost (Sample)

The percentage of seed germination rate if found to be greater than 90% for both Monocotyledon and Dicotyledon.

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