

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान (सिपेट)

(पूर्व में केंद्रीय प्लास्टिक्स इंजीनियरिंग एवं तकनीकी संस्थान)

रसायन एवं पेट्रोसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
प्लॉट नं. जे-3/2, एम.आई.डी.सी. औद्योगिक क्षेत्र,
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फोन : 0240 - 2478302-334
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वेबसाइट : www.cipet.gov.in
मुख्यालय : सिपेट, गिण्डी, चेन्नई-600 032



Central Institute of Petrochemicals
Engineering & Technology (CIPET)

(Formerly Central Institute of Plastics Engineering & Technology)

Department of Chemicals & Petrochemicals,
Ministry of Chemicals & Fertilizers, Govt. of India

Plot No. J-3/2, MIDC Industrial Area,
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Courier / Speed Post / By Hand

क्र.:सिपेट : सी एस टी एस/औ.बाद/परीक्षण/कार्य आदेश/188/2023-24/1226/1947.

दिनांक: 01.11.2023

प्रति,

TGP BIOPLASTICS
TGP Shed-1, RIT College,
Sakhrle, Islampur,
Tal - Walva, Dist - Sangli - 415414.

विषय : परीक्षण हेतु।

संदर्भ : Ref. No. OUT/DIR/2023/12

दिनांक: 24.04.2023

महोदय,

कृपया हमारी परीक्षण रिपोर्ट क्रमांक : 29061 along with Annexure दिनांक: 01.11.2023 प्राप्त करें।

संलग्न कस्टमर फीड बैक फार्म भरकर वापस भेजने का कष्ट करें।

धन्यवाद,

भवदीय,


निदेशक एवं प्रमुख

संलग्न : उपरोक्तानुसार

**सिपेट : सेन्टर फॉर स्किलिंग एण्ड
टेक्निकल सपोर्ट (सी एस टी एस)**

रसायन एवं पेट्रोसायन विभाग
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मुख्यालय : सिपेट, गिण्टी, चेन्नै-600 032



सिपेट CIPET



**CIPET : CENTRE FOR SKILLING AND
TECHNICAL SUPPORT (CSTS)**

Department of Chemicals & Petrochemicals,
Ministry of Chemicals & Fertilizers, Govt. of India
Plot No. J-3/2, MIDC Industrial Area,
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Tel. : 0240-2478310,312,302
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Website : www.cipet.gov.in
Head Office : CIPET, Guindy, Chennai-600 032

श्रेणी / SERIES : A

क्रं / No. 25573

प्लास्टिक्स परीक्षण केंद्र
PLASTICS TESTING CENTRE

परीक्षण रिपोर्ट / Test Report

Issued to:

TGP BIOPLASTICS
TGP Shed-1, RIT College,
Sakhrale, Islampur,
Tal - Walva, Dist - Sangli - 415414.

Test Report No : 29061
Dated : 01.11.2023
Your Ref : Ref. No. OUT/DIR/2023/12
Dated : 24.04.2023

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Test Report

PART - A

PARTICULARS OF SAMPLE SUBMITTED

a) Name of Sample	:	"Compostable and biodegradable films made from TGP Bioplastic's MVP Grade" as stated by party
b) Grade/Variety/Type/Size/Class	:	MVP -(As indicated on letter)
c) Declared value, if any	:	Starch, PBAT -(As indicated on letter)
d) Code No	:	MVP -(As indicated on letter)
e) Batch No. and Date of Manufacturing	:	23/04/2023 -(As indicated on letter)
f) Quantity	:	01 kg approx
g) Mode of Packing	:	Packed in Carton
h) Sealed or not	:	Not Sealed
i) Date of Receipt	:	25.04.2023
j) Date (s) of Performance of Test	:	25.04.2023 to 01.11.2023
k) Any other information	:	Application : Garbage bag, Nursery bag, Industrial packaging -(As indicated on letter)

PART - B

SUPPLEMENTARY INFORMATION

i) Reference to sampling procedure	:	Samples supplied by Party
ii) Supporting documents for the measurement taken and results derived	:	As given in Part C
iii) Deviation from the test method as prescribed in relevant work instruction, if any	:	Nil


01/11/2023


01/11/2023



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TGP Shed-1, RIT College,
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PART-C					
Test Result					
Sl. No	Name of test	Test Method	Unit	Test Result	Specified requirements
01	Material Identification	FTIR / DSC	--	Starch / Poly Butylene Adipate co-Terephthalate (PBAT) based material	PBAT/ Starch (As declared by party)
02	Disintegration (Dry mass remains in 2mm sieve after 84 days)	Cl. 6.2 of IS/ISO 17088 : 2021	%	5.32	Not more than 10
03	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	Cl. 6.3 of IS/ISO 17088 : 2021	%	92.70 % (At the end 120 days)	>90% (At the end of the test period not more than 180 days)
Plant Growth study					
04	Monocotyledon (corn) % Seed emergence	Cl 6.4.3 IS/ISO 17088 : 2021	%	92	>90
	Dicotyledon (chickpeas) % Seed emergence		%	94	>90
05	*Acute Ecotoxic Effects of Earthworm				
a.	Survival of adult earthworm at the end of 7 days	IS/ISO 17088 : 2021 Cl.No.6.4.4	%	100	>90
b.	Survival of adult earthworm at the end of 14 days		%	98	>90
c.	Biomass end of the 14 days		%	97	>90
06	Chronic ecotoxic effects to earthworm				
a.	Survival of adult earthworm at the end of 28 days	IS/ISO 17088 : 2021 Cl.No.6.4.5	%	97	>90
b.	Survival of adult earthworm at the end of 56 days		%	95	>90
c.	Offspring at the end of 56 days		%	95	>90
d.	Biomass end of the 56 days		%	96	>90

Note: The detailed observation on Biodegradability test is enclosed as Annexure.

[Signature]
01/11/2023

[Signature]
01/11/2023



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TGP BIOPLASTICS
TGP Shed-1, RIT College,
Sakhrale, Islampur,
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Test Result					
Sr. No.	Name of the test	Test Method/ Standard	Unit	Results Obtained	Specified Requirements
07	*Heavy metals Concentration				
1.	Arsenic (As)	Cl.No. 6.5.2 of IS/ISO-17088:2021	mg/l	0.02	10
2.	Copper (Cu)			0.59	300
3.	Nickel (Ni)			0.72	50
4.	Zinc (Zn)			0.96	1000
5.	Cobalt(Co)			--	--
6.	Chromium (Cr)			0.89	50
7.	Molybdenum (Mo)			--	--
8.	Mercury (Hg)			0.00	0.15
9.	Cadmium (Cd)			0.03	5
10.	Lead (Pb)			1.22	100
11.	Selenium (Se)			--	--

(*) – Based on the solid waste management Rules, 2016 notified on 08th April 2016 by Ministry of Environment, Forests & Climate Change, and Government of India.

PART-D
Remarks: Nil

- NOTE :**
- 01 This Test Report/ Certificate are issued only for the samples submitted to the laboratory.
 - 02 The results stated above related only to the items tested.
 - 03 The quality of the subsequent production lot has to be ensured by the purchaser.
 - 04 This Test Report shall not be reproduced except in full without the written approval of the laboratory.
 - 05 Any anomaly/discrepancy in this report should be brought to the notice of the laboratory within 30 days from the date of issue.
 - 06 Subcontracted Tests (if any): *Heavy metals Concentration Test Subcontracted from CIPET: SARP-LARPM, Bhubaneswar.


Authorized Signatory
Kirankumar V. Koli
Asst. Technical Officer


Authorized Signatory
Dr. Piyush Kumar
Technical Officer

ANALYSIS RESULT

Test Report No. : 29061

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Dated. 01.11.2023OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088: 2021**Name of the Party :-**TGP BIOPLASTICS
TGP Shed-1, RIT College,
Sakhrale, Islampur,
Tal - Walva, Dist - Sangli - 415414.**Customers Details**

1. Sample Details (As stated the party) : "Compostable and biodegradable films made from TGP Bioplastic's MVP Grade" - (As indicated on letter)
2. Material Identification by FTIR & DSC : Starch/ Poly Butylene Adipate co-Terephthalate (PBAT) based material

3. Observation:a. Conditions of reaction mixtures

- Origin of Compost : Livestock excrement, municipal & vegetable
- Reaction Temperature : 58°C ($\pm 2^\circ\text{C}$)
- Dry Solid (%) : 60.41%
- Volatile Content (%) : 36.30%
- CO₂ evolved during first 10days in blank vessels : 75.07mg/g of volatile solids of compost.
- Test duration : 120 day
- Reference material : Cellulose
- Volume of reaction vessel : 3000ml

b. pH of test Medium:

Sr. No.	Composting vessel	pH (before)	pH (after)
1	Blank 1	7.5	7.0
2	Blank 2	7.5	7.5
3	Blank 3	7.0	7.0
4	Cellulose 1	8.0	7.5
5	Cellulose 2	7.5	8.0
6	Cellulose 3	7.0	7.5
7	Negative 1	7.5	7.5
8	Negative 2	7.0	7.0
9	Negative 3	7.5	7.0
10	Sample-1	7.5	7.5
11	Sample -2	7.0	7.0
12	Sample - 3	8.0	7.5

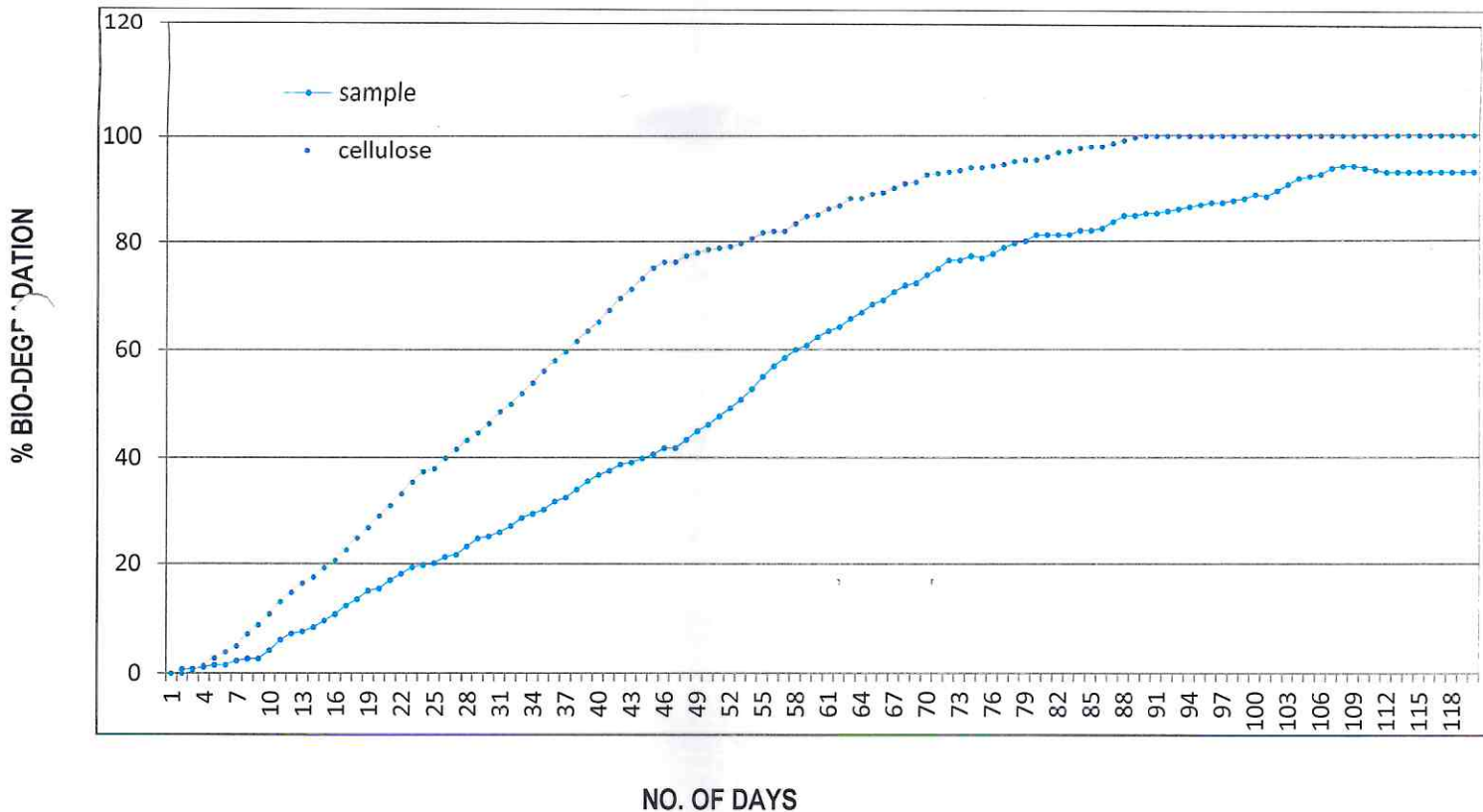

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4. Result: Percentage Biodegradation relative to positive reference

Mean (%): 92.70%

The Reference material-cellulose (%): 100




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01/11/2023


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01/11/2023

5) Visual Observation of sample

Description	Week 1/2	Week 3/4	Week 5/6	Week 7/8
Structure	Square film plastic	Square film plastic	Cracks on surface	Broken into the pieces
Moisture	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level
Colour	White color	White color	light Brown	light Brown
Fungal Development	None	None	None	None
Smell	No smell	No smell	Organic/Dirt like	Organic/Dirt like
Description	Week 9/10	Week 11/12	Week 13/14	Week 15/16
Structure	Broken into the pieces	Converted into small Particles	small particles mixed with the compost	Very small particles well mixed with the compost
Moisture	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level
Colour	light Brown	Dark Brown	Dark Brown	Dark Brown
Fungal Development	None	None	None	None
Smell	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like
Description	Week 17			
Structure	Very small particles well mixed with the compost			
Moisture	Appropriate Moisture level			
Colour	Dark Brown			
Fungal Development	None			
Smell	Organic/Dirt like			

5) Visual Observation of Compost

Description	Week 1/2	Week 3/4	Week 5/6	Week 7/8
Structure	Fine Particles	Fine Particles	Fine Particles	Fine Particles
Moisture	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level
Colour	Dark brown	Dark brown	Dark brown	Dark brown
Fungal Development	None	None	None	None
Smell	No smell	No smell	Organic/Dirt like	Organic/Dirt like
Description	Week 9/10	Week 11/12	Week 13/14	Week 15/16
Structure	Fine Particles	Fine Particles	Fine Particles	Fine Particles
Moisture	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level	Appropriate Moisture level
Colour	Dark brown	Dark brown	Dark brown	Dark brown
Fungal Development	None	None	None	None
Smell	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like	Organic/Dirt like
Description	Week 17			
Structure	Fine Particles			
Moisture	Appropriate Moisture level			
Colour	Dark brown			
Fungal Development	None			
Smell	Organic/Dirt like			



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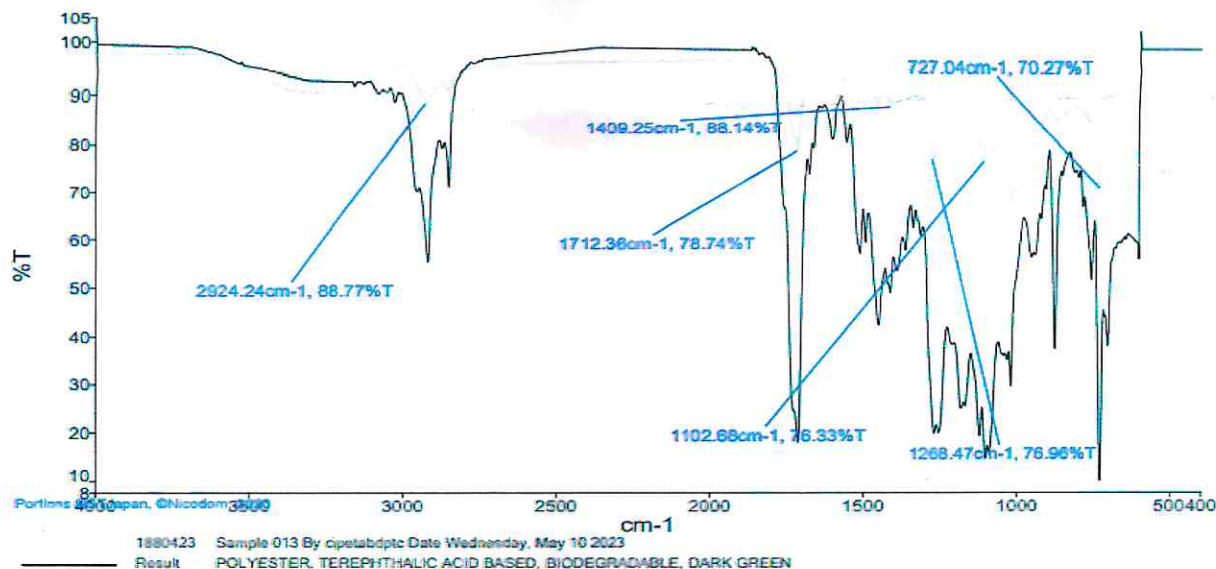
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Test Report No. : 29061

ANALYSIS RESULT

6. FTIR Analysis: Starch / Poly Butylene Adipate -co-Terephthate (PBAT) based material

Sample Details: "Compostable and biodegradable films made from TGP Bioplastic's MVP Grade"- as stated by the

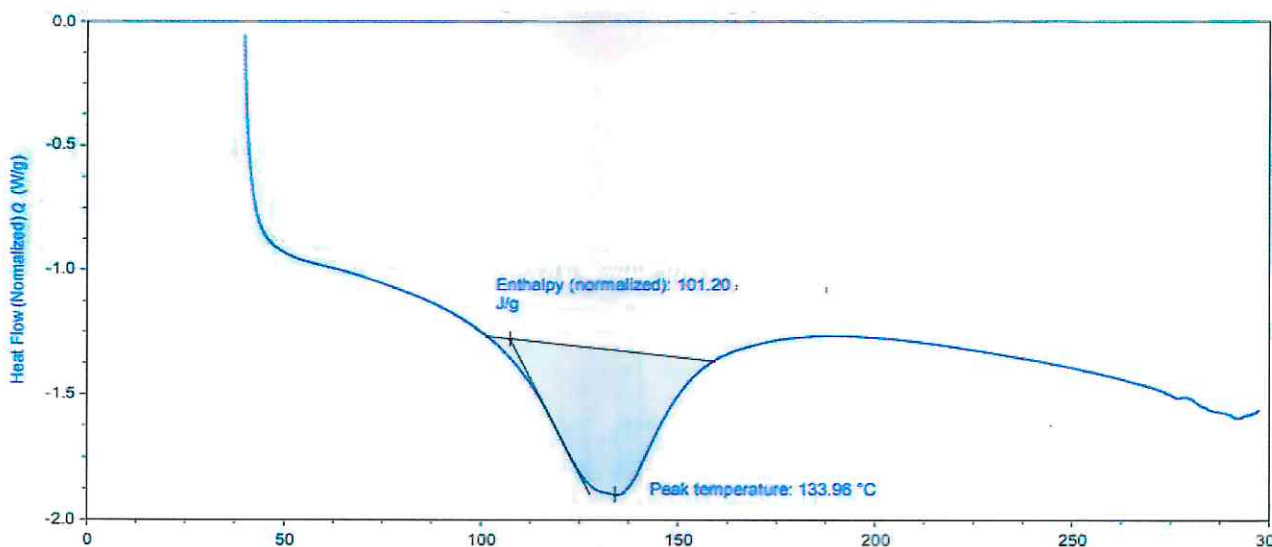


Source Spectra		
Sample Name	Search Best Hit	Search Best Hit Description
1880423	Result	POLYESTER, TEREPHTHALIC ACID BASED, BIODEGRADABLE, DARK GREEN

party

7. DSC Analysis:

1880423

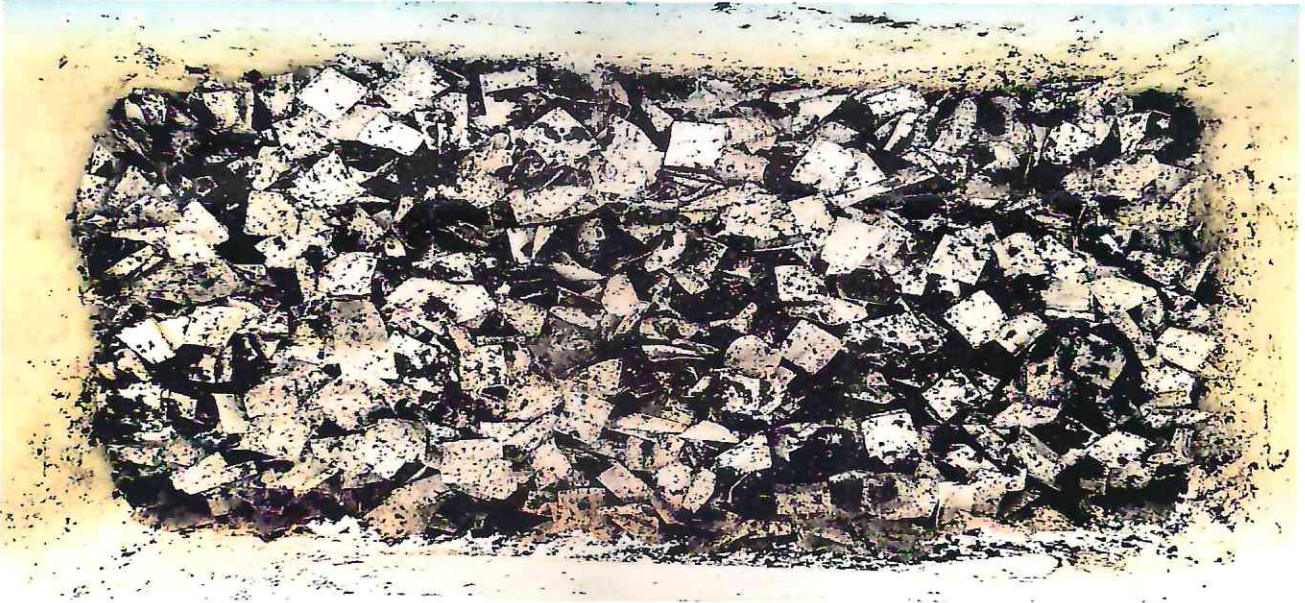


Comments: The above DSC & FTIR analysis indicates the submitted sample is Starch / Poly Butylene Adipate -co-Terephthate (PBAT) based material.

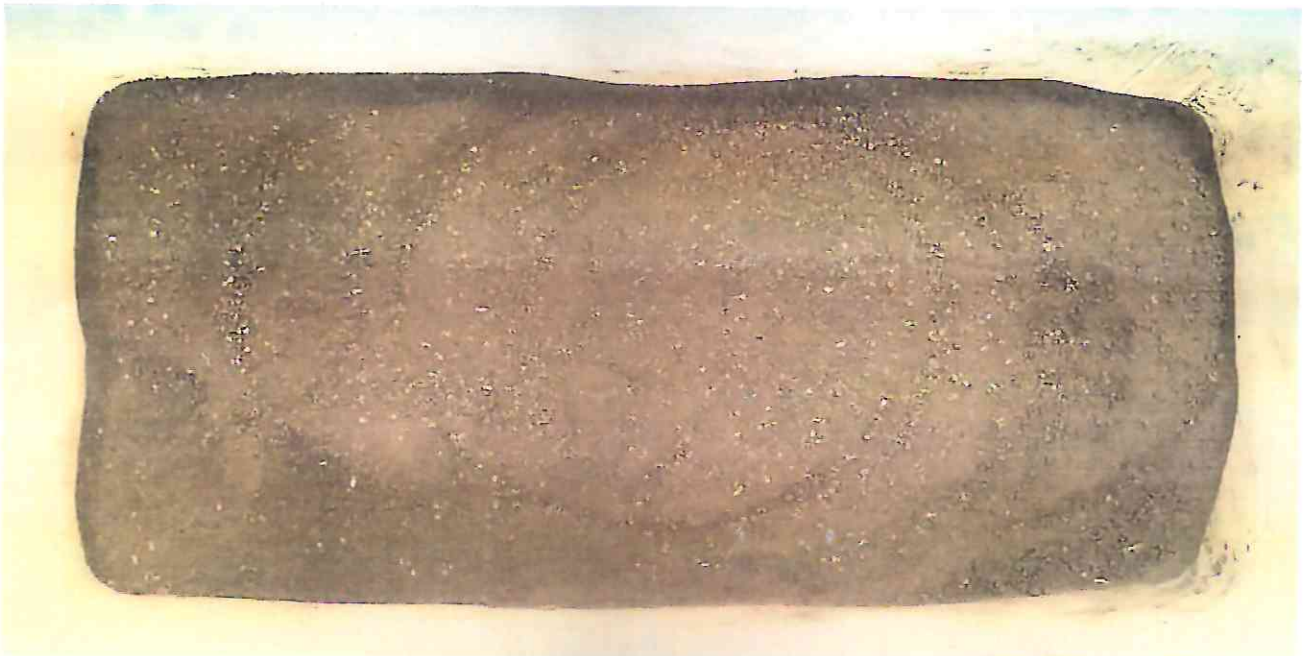
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8. DISINTEGRATION – AFTER 17 WEEKS

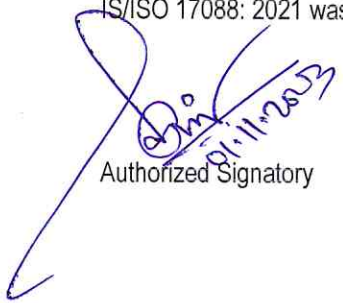


BEFORE DISINTEGRATION



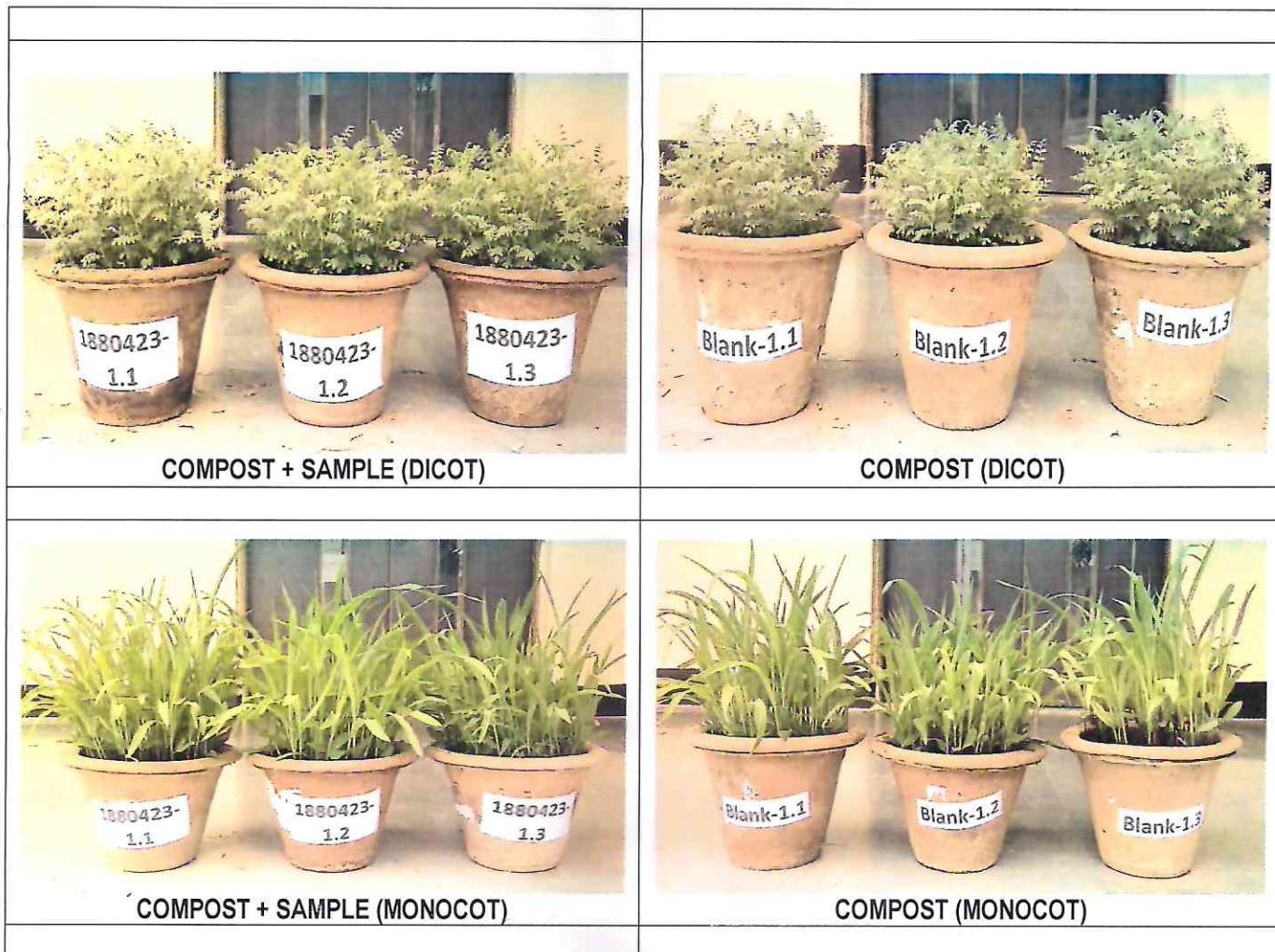
AFTER DISINTEGRATION

The disintegration of the supplied sample by passing through 2mm sieve after 17 week in composting condition as per - IS/ISO 17088: 2021 was found not more than 10% of original dry mass remain.


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9. GERMINATION AND PLANT GROWTH STUDY



The Percentage of Seed Germination rate is found to be greater than 90% for both **Compost** and **Sample**


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