

**सिपेट : पेट्रोकेमिकल्स तकनीकी  
संस्थान (आईपीटी)**

(पूर्व में सेन्ट्रल इंस्टिट्यूट ऑफ प्लास्टिक्स इंजीनियरिंग एण्ड टेक्नोलॉजी)  
रसायन एवं पेट्रोसायन विभाग  
रसायन एवं उर्वरक मंत्रालय, भारत सरकार  
गिण्डी, चेन्नै - 600 032.  
फोन : 91-44-2225 4701 (6 लाइन)  
फैक्स : 91-44-22254707  
ई-मेल : chennai@cipet.gov.in  
वेबसाइट : www.cipet.gov.in



**CIPET सि पेट**  
probe - perform - practice - Plastics



**CIPET : INSTITUTE OF PETROCHEMICALS  
TECHNOLOGY (IPT)**

(Formerly Central Institute of Plastics Engineering & Technology)

Department of Chemicals & Petrochemicals

Ministry of Chemicals & Fertilizers, Govt. of India

Guindy, Chennai - 600 032.

Phone : 91-44-2225 4701 (6 Lines)

Fax : 91 - 44 - 22254707

E-mail : chennai@cipet.gov.in

Website : www.cipet.gov.in

संदर्भ/Ref: परीक्षण/TR/ 23013092

दिनांक/Date: 18-10-2023

प्रति /To,

Bio Green Solutions

Plot No.23, Kalyani Estate, Athipattu, Chennai - 600 058

विषय/Sub : Testing of samples-reg.

संदर्भ/Ref : Your letter no. --

Dated: 20-01-2023

महोदय,

कृपया हमारी परीक्षण रिपोर्ट क्रमांक प्राप्त करें। Please find enclosed herewith our Test Report no.	74486	दिनांक dated	18-10-2023
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धन्यवाद,

भवदीय  
  
अधिकृत हस्ताक्षरकर्ता

संलग्न : उपर्युक्तानुसार

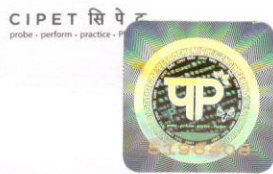
Encl: 1.a/a.

2. Invoice No. 1593

Dt. 26-10-23

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं  
प्रौद्योगिकी संस्थान  
पेट्रोकेमिकल्स तकनीकी संस्थान

रसायन एवं पेट्रोसायन विभाग  
रसायन एवं उर्वरक मंत्रालय, भारत सरकार  
गिण्टी, चेन्नै - 600 032.  
फोन : 91-44-2225 4701-6 फैक्स : 91-44-22254707  
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CENTRAL INSTITUTE OF PETROCHEMICALS  
ENGINEERING & TECHNOLOGY  
INSTITUTE OF PETROCHEMICALS TECHNOLOGY

Department of Chemicals & Petrochemicals  
Ministry of Chemicals & Fertilizers, Govt. of India  
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E-mail : chennai@cipet.gov.in Website : www.cipet.gov.in

**परीक्षण रिपोर्ट / TEST REPORT**

33802

को जारी /  
Issued to :

**Bio Green Solutions**

Plot No.23, Kalyani Estate, Athipattu, Chennai - 600 058

क्र.सं / Sl. No.

रिपोर्ट सं / **REPORT NO. : 74486**

दिनांक / Date : **18-10-2023**

संदर्भ / Customer Let. Ref : --

20-01-2023 Pages...08.....Nos. Part A,B,C & D

परीक्षण मानक स्तर के अनुसार परीक्षण रिपोर्ट / TEST REPORT AS PER TEST STANDARD : Refer Part C

**भाग - क / PART - A**

**प्रस्तुत सैपिल का विवरण / PARTICULARS OF SAMPLE SUBMITTED**

अ) सैपिल का नाम / a) Name of the Sample : Compostable Film - as stated by the party

आ) सैपिल प्राप्त होने की तारीख / b) Date of Receipt of sample : 20-01-2023

इ) ग्रेड/प्रकार/आकार/वर्ग / c) Grade / variety / type / size / class : Nil

ई) घोषित मूल्य / d) Declared value, If any : Nil

उ) कोड सं. / e) Code No. : Nil

ऊ) बैच सं. एवं निर्माण तारीख / f) Batch No. and Date of Manufacture: Nil

ऋ) मात्रा / g) Quantity : 2 kg

ए) पैकिंग की रीति / h) Mode of Packing : No packing

ऐ) मोहर बंद या नहीं / i) Sealed or not : Not Sealed

ओ) कोई अन्य सूचना / j) Any other information : --

23013092

**भाग - ख / PART - B**

**अनुपूरक सूचनाएँ / SUPPLEMENTARY INFORMATIONS**

अ) सैपिलिंग कार्यवाहियों हेतु संदर्भ / a) Reference to sampling procedure : Sampling not done by this lab

आ) माप करने हेतु लिए गए सहायक दस्तावेज एवं प्राप्त परिणाम  
b) Supporting documents for the measurement taken and result derived : As given in Part C

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं  
प्रौद्योगिकी संस्थान  
पेट्रोकेमिकल्स तकनीकी संस्थान

रसायन एवं पेट्रोसायन विभाग  
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परीक्षण रिपोर्ट / TEST REPORT

रिपोर्ट सं / REPORT NO. : 74486

क्र.सं / Sl. No. 33802

18-10-2023

दिनांक / Date :

भाग - ग / PART - C

परीक्षण परिणाम / TEST RESULTS

Test Duration: 06.04.2023 to 18.10.2023

Sl.No	Name of the Test	Test Method/ Standard	Unit	Results Obtained	Specified Requirements
1	Material Identification	FTIR & DSC	-	Poly Butylene Adipate Co-Terephthalate (PBAT)	-
2	Disintegration (Dry mass remains in 2 mm sieve after 84 days)	ISO 17088:2021	%	7.4	No more than 10%
3	Ultimate aerobic Biodegradation (with reference to 100% degradation of positive reference)	ISO 17088:2021	%	91.2 (at the end of 124 days)	> 90 (at the end of the test period not more than 180 days.)
4	Plant Growth study				
	Monocotyledon (Onion) % Seed emergence	ISO 17088:2021 Cl.6.4.3	%	100	> 90
	Dicotyledon (Fenugreek) % Seed Emergence		%	94	> 90
5	Acute Ecotoxic effects to earthworm				
a	Survival of adult earthworm at the end of 7 days	ISO:17088:2021 Cl.6.4.4	%	100	> 90
b	Survival of adult earthworm at the end of 14 days			95	> 90
c	Biomass end of the 14 days			97	> 90
6	Chronic Ecotoxic effects to earthworm				
a	Survival of adult earthworm at the end of 28 days	ISO:17088:2021 Cl.6.4.5	%	95	> 90
b	Survival of adult earthworm at the end of 56 days			94	> 90
c	Offspring at the end of 56 days			92	> 90
d	Biomass end of the 56 days			94	> 90

The detailed observation on biodegradability test is enclosed as Annexure

Contd.

Issued to:  
M/s. BIO GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600 058.  
Ref. Letter dated 20-01-2023



सिपेट : आई पी टी -चेन्नै-32.

CIPET : IPT- Chennai-32.



Continuation Sheet

रिपोर्ट सं / REPORT NO. : 74486

परीक्षण परिणाम / TEST RESULTS

दिनांक / Date : 18-10-2023

Issued to: M/s. BIO GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600058.

Customer Letter Ref. dtd. 21-01-2023

### PART C - TEST RESULTS

Sl.No	Name of the Test	Test Method/ Standard	Unit	Results Obtained	Specified Requirements*
7	Heavy metals concentration				
a.	Arsenic (As)			0.045	10
b.	Copper (Cu)			3.233	300
c.	Nickel (Ni)			1.741	50
d.	Zinc (Zn)			7.848	1000
e.	Cobalt (Co)	ISO	mg/kg	1.875	-
f.	Chromium (Cr)	17088:2021		2.675	50
g.	Molybdenum (Mo)			11.436	-
h.	Mercury (Hg)			0.005	0.15
i.	Cadmium (Cd)			0.043	5
j.	Lead (Pb)			0.801	100
k.	Selenium (Se)			0.098	-

\* Based on Municipal solid waste (Management and Handling) Rules, 2016 notified on 8th April, 2016 by Ministry of Environment , Forests and climate change, Government of India. Note that concentration of metals like cobalt, molybdenum, and selenium is not mentioned in the notification.

### PART D - REMARKS

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): Nil

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Continuation Sheet

रिपोर्ट सं / REPORT NO. : 74486

परीक्षण परिणाम / TEST RESULTS

दिनांक / Date : 18-10-2023

Issued to: M/s. BIO GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600058.

Customer Letter Ref. dtd. 21-01-2023

### OBSERVATION FOR BIODEGRADABILITY TEST AS PER ISO 17088:2021

- 1 **Sample Details (As stated by Party):** Compostable Film  
2 **Material Identification by FTIR :** Poly Butylene Adipate Co-Terephthalate (PBAT)

### BIODEGRADABILITY TEST AS PER ISO:14855-1

3 **Observation**

(i) Conditions of reaction mixtures

Origin of Compost: Livestock excrement, municipal and vegetable waste

Reaction Temperature (°C) : 58

Dry Solid (%) : 54.8

Volatile content (%) : 16.9

CO<sub>2</sub> evolved during first 10days in blank : 55.44 mg/g

Test duration (days) : 124 days

Reference material : Cellulose

Volume of reaction vessel (mL) : 3000 ml

(ii) pH of test medium :

S.No.	Compost Vessel	pH (Before)	pH (After)
1	Blank 1	7.1	7.1
2	Blank 2	7.2	7.2
3	Blank 3	7.2	7.3
4	Cellulose 1	7.1	7.1
5	Cellulose 2	7.4	7.2
6	Cellulose 3	7.4	7.3
7	Negative 1	7.3	7.3
8	Negative 2	7.3	7.2
9	Negative 3	7.3	7.1
10	Sample 1	7.2	7.1
11	Sample 2	7.2	7
12	Sample 3	7.3	7.3

Contd.,

सिपेट : आई पी टी -चेन्नै-32.

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रिपोर्ट सं / REPORT NO. : **74486**

परीक्षण परिणाम / TEST RESULTS

दिनांक / Date :  
**18-10-2023**

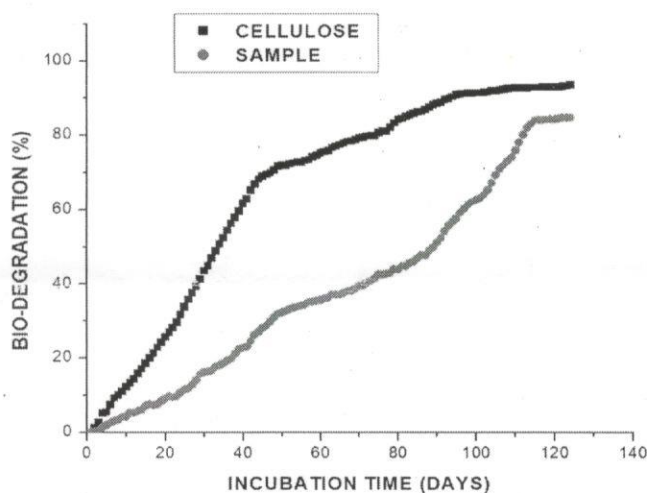
Issued to: M/s. BIO, GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600058.

Customer Letter Ref. dtd. 21-01-2023

**4 Result:** Percentage biodegradation relative to positive reference

Sample (Mean) : 91.2 % (at the end of 124 days)

The reference Material - cellulose : ~ 100%



**5 Visual Observation of Sample**

Description	Week 1-3	Week 4-6	Week 7-9
Structure	Cut pieces	Cut pieces	Fragmented pieces
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	White	Dirty	Dirty
Fungal Development	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

Description	Week 10-12	Week 13-15	week 16-18
Structure	Fragmented pieces	Fragmented pieces	Fragmented pieces
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Dirty	Dirty	Dirty
Fungal Development	None	None	None
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

Contd.,



सिपेट : आई पी टी -चेन्नै-32.

CIPET : IPT- Chennai-32.



Continuation Sheet

रिपोर्ट सं / REPORT NO. : **74486**

परीक्षण परिणाम / TEST RESULTS

दिनांक / Date :  
**18-10-2023**

Issued to: M/s. BIO GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600058.

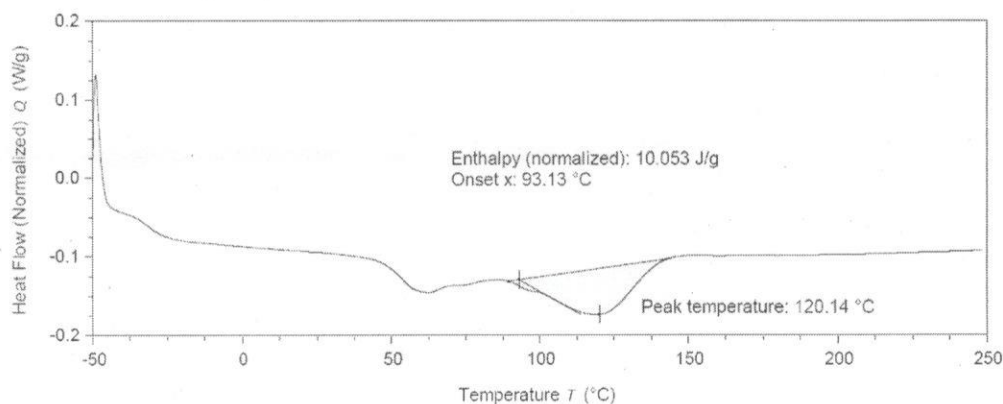
Customer Letter Ref. dtd. 21-01-2023

## 6 Visual Observation of Compost

Description	Week 1-3	Week 4-6	Week 7-9
Structure	Fine Particles	Fine Particles	Fine Particles
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Dark Brown	Dark Brown	Dark Brown
Fungal Development	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

Description	Week 10-12	Week 13-15	Week 16-18
Structure	Fine Particles	Fine Particles	Fine Particles
Moisture	Adequate moisture Level	Adequate moisture Level	Adequate moisture Level
Colour	Dark Brown	Dark Brown	Dark Brown
Fungal Development	Nil	Nil	Nil
Smell	Organic/dirt like	Organic/dirt like	Organic/dirt like

## 7 DSC Analysis



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रिपोर्ट सं / REPORT NO. : 74486

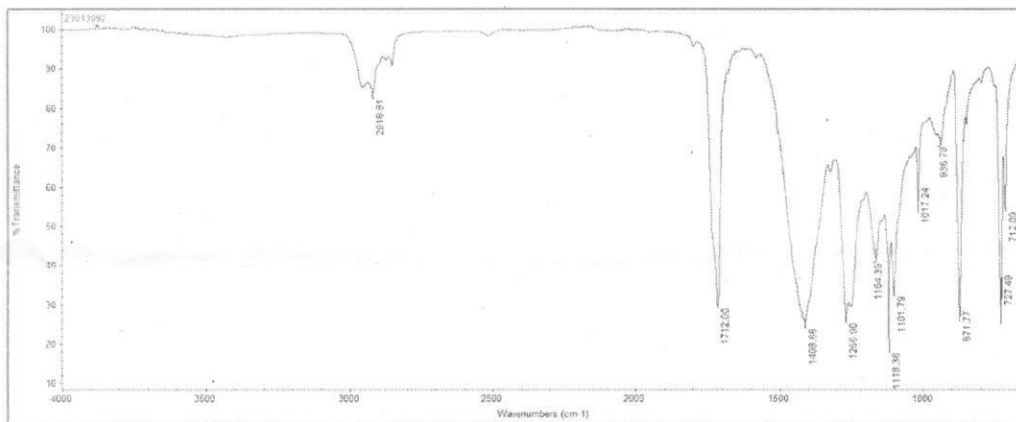
परीक्षण परिणाम / TEST RESULTS

दिनांक / Date : 18-10-2023

Issued to: M/s. BIO GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600058.

Customer Letter Ref. dtd. 21-01-2023

## 8 FTIR Analysis



### FTIR Interpretation

Wave number (cm <sup>-1</sup> )	Nature of Bond
2918	C-H stretch
1712	C=O stretch
1408	C=C stretch
1266	C-H in Plane bend
1101	C-C stretch
1017	C-O stretch
871	C-H bend
727	C-H bend

**Comment:** The above DSC & FTIR analysis indicates the above sample is Poly Butylene Adipate Co-Terephthalate (PBAT)

Contd.,

7/6/8



सिपेट : आई पी टी -चेन्नै-32.

CIPET : IPT- Chennai-32.



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रिपोर्ट सं / **REPORT NO. : 74486**

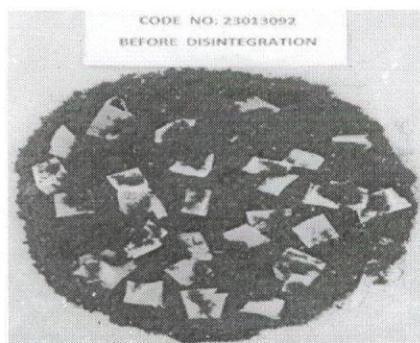
परीक्षण परिणाम / **TEST RESULTS**

दिनांक / Date :  
**18-10-2023**

Issued to: M/s. BIO GREEN SOLUTIONS,  
Plot No.23, Kalyani Estate, Athipattu, Chennai 600058.

Customer Letter Ref. dtd. 21-01-2023

## 9 Disintegration After 12 Weeks



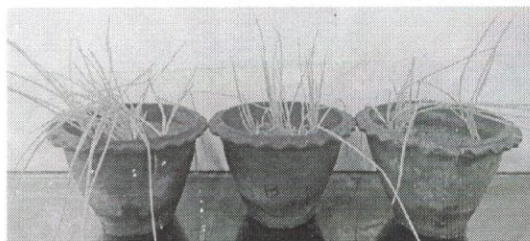
Before Disintegration



After Disintegration

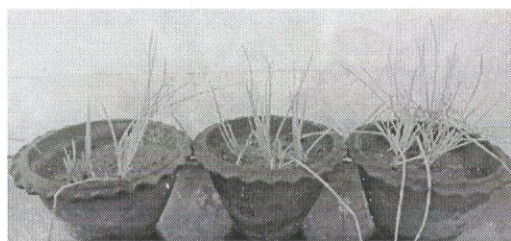
The disintegration of the supplied sample by passing through 2 mm sieve after 12 week in composting condition as per ISO 17088-2021 was found not more than 10% of original dry mass remain.

## 10 Plant growth study



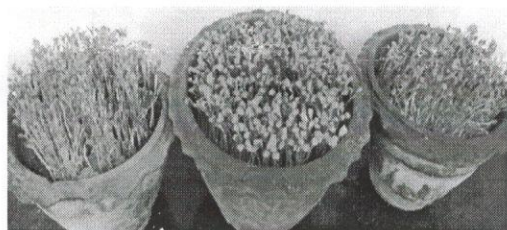
REP-1 REP-2 REP-3

Fresh compost with Onion seeds



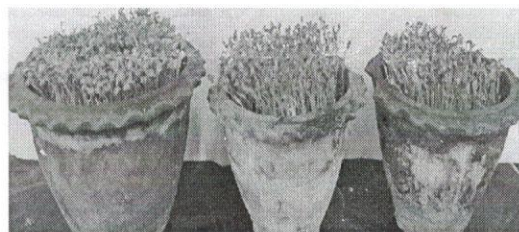
REP-1 REP-2 REP-3

Bio-degradation tested compost with Onion seeds



REP-1 REP-2 REP-3

Fresh compost with Fenugreek seeds



REP-1 REP-2 REP-3

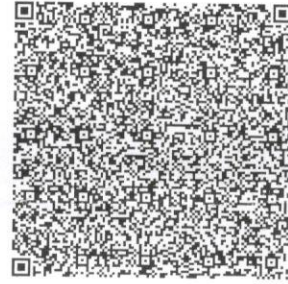
Bio-degradation tested compost with Fenugreek seeds

The percentage of seed germination rate is found to be greater than 90% for both Onion and Fenugreek

## Tax Invoice

e-Invoice

IRN : 2903af1986266c00512591a34b81a15ab290873f36ed6-556ad71e3aeb3e212e0  
 Ack No. : 152316067730515  
 Ack Date : 26-Oct-23



 Central Institute of Petrochemicals Engineering & Technology Department of Chemicals & Petrochemicals Ministry of Chemicals & Fertilizers, Govt. of India Guindy, Chennai - 600 032 Ph. 044 - 22254705 GSTIN/UIN: 33AAAAC0606R1ZW State Name : Tamil Nadu, Code : 33 Contact : 04422254701 E-Mail : chennai@cipet.gov.in	Invoice No.	Dated
	CH/TE/23-24/1593	26-Oct-23
Buyer (Bill to) <b>Bio Green Solution</b> Plot No:23 Kalyani Estate, Athipattu Chennai 600058 GSTIN/UIN : 33AAZFB4305Q1ZW State Name : Tamil Nadu, Code : 33	Delivery Note	Mode/Terms of Payment
	Reference No. & Date.	Other References
	Buyer's Order No.	Dated
	Dispatch Doc No.	Delivery Note Date
	Dispatched through	Destination
Terms of Delivery		

SI No.	Description of Services	HSN/SAC	Quantity	Rate	per	Disc. %	Amount
1	<b>Bio Degradable Test</b> <i>Ultimate Aerobic Biodegradability Under Composting Condition</i>	998393	1.0000 Nos	3,75,000.00	Nos	25 %	2,81,250.00
	SGST			9 %			25,312.50
	CGST			9 %			25,312.50
Total			1.0000 Nos				₹ 3,31,875.00

Amount Chargeable (in words)

E. &amp; O.E

Indian Rupees Three Lakh Thirty One Thousand Eight Hundred Seventy Five Only

Taxable Value	Central Tax		State Tax		Total Tax Amount
	Rate	Amount	Rate	Amount	
2,81,250.00	9%	25,312.50	9%	25,312.50	50,625.00
Total: 2,81,250.00		25,312.50		25,312.50	50,625.00

Tax Amount (in words) : Indian Rupees Fifty Thousand Six Hundred Twenty Five Only

Remarks:  
 WO NO:23013092 TR NO:74486 DT:18.10.23 letter dt:20.01.23

Company's PAN : AAAAC0606R

Declaration

We declare that this invoice shows the actual price of the goods described and that all particulars are true and correct.

Company's Bank Details  
 A/c Holder's Name : CIPET  
 Bank Name : State Bank of India 10565622389  
 A/c No. : 10565622389  
 Branch & IFS Code : SME Guindy & SBIN0004327

for Central Institute of Petrochemicals Engineering &amp; Technology

Authorised Signatory