



KERALA STATE POLLUTION CONTROL BOARD

കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്

Pattom P.O., Thiruvananthapuram – 695 004

പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004



File No. PCB/HO/EE3/CERTFN-4/2023

Date: 16/02/2024

Certificate No: PCB/HO/PE/CERTFN/03/2024 dated 16.02.2024.

To

M/s Redarrows Advertising Pvt Ltd
71/1162A, Redarrows House
Thannickal jn. Elamakkara , Cochin-682026

Sub: Certificate to Distributor - M/s Redarrows Advertising Pvt Ltd 71/1162A, Redarrows House Thannickal jn. Elamakkara , Cochin for certification of material for banner and hoarding.

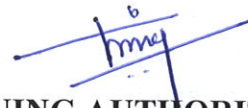
- Ref: 1. Your application no: Nil dated 13/12/2023
2. Report no. CIPET/KOCHO/CONS.07/2023-24/TC-07 dated 02.02.2024 received from CIPET. (Copy enclosed).
3. GO No. 639/2023/LSGD dated 17.03.2023
4. GO No. 111/2019/LSGD dated 29.08.2019
5. SOP No.KSPCB/732/2023-SEE-3 dated.10.08.2023 issued by Kerala State Pollution Control Board

With reference to the application received from M/s Redarrows Advertising Pvt Ltd, whose registered address is at 71/1162A, Redarrows House Thannickal jn. Elamakkara Cochin-682026 is fulfilling the standard stipulated in GOs and SOP referred above.

Certificate to M/s Redarrows Advertising Pvt Ltd 71/1162A, Redarrows House Thannickal jn. Elamakkara, Cochin for distributing *polyethylene material* for banner and hoarding material is subject to following conditions.

1. Each material shall have the information related to name and certificate number printed in English.
2. A QR code to the Certificate issued by the Board shall be prepared by M/s. Redarrows Advertising Pvt Ltd, which on scanning has to be lead detailing the contents of this Certificate. The distributor shall provide this QR code to printer units also.

3. The details of the QR code (email/password, Name, plant address, KSPCB certificate no. etc.) shall be shared with the printer units and KSPCB (Head Office).
4. If the certified distributor is found non-complying any conditions, the Certificate shall stand cancelled.
5. The distributor shall provide six-monthly report, giving details of material sale viz. name of printing unit, district, date of issue etc.
6. PCB may cancel or suspend the certificate of the distributor, in case the distributor fails to comply with any of the conditions of the certificate.



ISSUING AUTHORITY

**(Environmental Engineer,
Plastic Section, Head Office)**



Copy to:

- 1) All ROs, DOs
- 2) CA to Chairperson and Member Secretary,

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं
प्रौद्योगिकी संस्थान (सिपेट)
(पूर्व में सेंट्रल इंस्टिट्यूट ऑफ प्लास्टिक्स इंजीनियरिंग एण्ड टेक्नोलॉजी)
इंस्टिट्यूट ऑफ पेट्रोकेमिकल टेक्नोलॉजी (आई.पी.टी.)
रसायन एवं पेट्रोसायन विभाग
रसायन एवं उर्वरक मंत्रालय, भारत सरकार
एच.आई.एल.कॉलोनी, एडयार रोड, Nr. पातालम्
उद्योगमंडल पी.ओ., कोच्चि, केरल - 683 501
फोन : 0484-2547741
ई-मेल : kochi@cipet.gov.in, cipetkochi@gmail.com
वेबसाईट : www.cipet.gov.in
मुख्यालय : गिण्डी, चेन्नई - 600 032

590
16/2/24
PP
सिपेट CIPET



Eno: 45341/2024
CENTRAL INSTITUTE OF PETROCHEMICALS
ENGINEERING & TECHNOLOGY (CIPET)
(Formerly Central Institute of Plastics Engineering & Technology)
INSTITUTE OF PETROCHEMICALS TECHNOLOGY (IPT)
Department of Chemicals & Petrochemicals
Ministry of Chemicals & Fertilizers, Govt. of India
HIL Colony, Edayar Road, Nr. Pathalam
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E-mail: kochi@cipet.gov.in, cipetkochi@gmail.com
Web : www.cipet.gov.in
Head Office: Guindy, Chennai-600 032

CIPET: IPT-Kochi /Testing/2023-24/TC-071/3142^a

Date: 05.02.2024

To

M/s.KERALA STATE POLLUTION CONTROL BOARD
PATTOM P.O, THIRUVANANTHAPURAM – 695 004

Dear Sir,

Sub.: Report on Recyclability Assessment – Reg.
Ref.: Letter FILE No.PCB/HO/EE3/CERTN- 4/2023 Dated 16.12.2023.

We are enclosing herewith consultancy report CIPET/KOCHI/CONS. /2023-24/TC-07 dated 02.02.2024 on pertaining to the samples submitted to our laboratory.

Please find enclosed herewith the feedback form. Kindly fill and send it back to us.

Thanking you and assuring you our best services.

Yours sincerely,

Joint Director & Head

Encl. as above.

16/2/2024

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, बदी, वालासोर, वेंगलूर, भोपाल, भुवनेश्वर, चंद्रपुर, चेन्नई, देहरादून, गुवाहाटी, ग्वालियर, हैदराबाद, हजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरबा, लखनऊ, मदुरै, मुरथल, मैसूरु, रायपुर, राँची, वलसाड, वाराणसी, एवं विजयवाडा

Centres : Ahmedabad, Amritsar, Aurangabd, Agartala, Baddi, Balasore, Bengaluru, Bhopal, Bhubaneswar, Chandrapur, Chennai, Dehradun, Guwahati, Gwalior, Hyderabad, Hajipur, Haldia, Imphal, Jaipur, Kochi, Korba, Lucknow, Madurai, Murthal, Mysuru, Rajpur, Ranchi, Valsad, Varanasi & Vijayawada

केंद्रीय पेट्रोसायन अभियांत्रिकी एवं

प्रौद्योगिकी संस्थान (सिपेट)

(पूर्व म सेन्ट्रल इंस्टिट्यूट ऑफ प्लास्टिक्स इंजीनियरिंग एण्ड टेक्नोलॉजी)

इंस्टिट्यूट ऑफ पेट्रोकेमिकल टेक्नोलॉजी (आई.पी.टी.)

रसायन एवं पेट्रोसायन विभाग

रसायन एवं उर्वरक मंत्रालय, भारत सरकार

एच.आई.एल. कॉलोनी, एडयार रोड, Nr. पातालम्

उद्योगमंडल पी.ओ., कोच्चि, केरल - 683 501

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वेबसाइट : www.cipet.gov.in

मुख्यालय : गिण्डी, चेन्नई - 600 032



सिपेट CIPET



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(Formerly Central Institute of Plastics Engineering & Technology)

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Web : www.cipet.gov.in

Head Office: Guindy, Chennai-600 032

CIPET/KOCHO/CONS.07 /2023-24/TC-07

02.02.2024

To

KERALA STATE POLLUTION CONTROL BOARD
Pattom P.O., Thiruvananthapuram


CERTIFICATE OF ANALYSIS

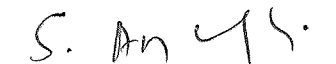
Sample Details (As stated by party)	: Material for banner and hoarding (Unprinted)
Quantity of sample submitted	: 2 kg
Name of the applicant	: M/s.Redarrows Advertising Pvt.Ltd, Cochin
Brand Name:	: Green Eco Media 100%PE
Sampling	: By the party

Test results Obtained:

Sample Details	Test details	Recycling Category as per IS 14534 : 2016
		Material Recovery Mechanical Recycling
Material for banner and hoarding (As stated by party)	Assessment of recyclability of Film and certify its category as per IS:14534 (2016)	Suitable in the existing format

Detailed technical analysis on the above results is enclosed as Annexure.


Dr. K.P. Bhuvana
Authorized Signatory


Dr. S. Anbudayanidhi
Authorized Signatory

केन्द्र : अहमदाबाद, अमृतसर, औरंगाबाद, अगरतला, वडी, वालासोर, वेंगलूर, भोपाल, भुवनेश्वर, चंद्रपुर, चेन्नई, देहरादून, गुवाहाटी, ग्वालियर, हैदराबाद, हजीपुर, हल्दिया, इम्फाल, जयपुर, कोच्चि, कोरबा, लखनऊ, मदुरै, मुरथल, मैसूरु, रायपुर, राँची, बलसाड, वाराणसी, एवं विजयवाडा

Centres : Ahmedabad, Amritsar, Aurangabd, Agartala, Baddi, Balasore, Bengaluru, Bhopal, Bhubaneswar, Chandrapur, Chennai, Dehradun, Guwahati, Gwalior, Hyderabad, Hajipur, Haldia, Imphal, Jaipur, Kochi, Korba, Lucknow, Madurai, Murthal, Mysuru, Rajpur, Ranchi, Valsad, Varanasi & Vijayawada

**REPORT
ON
RECYCLABILITY ASSESSMENT**

**Submitted
By**



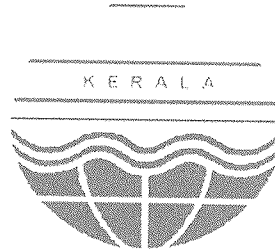
सिपेट CIPET

**Central Institute of Petrochemicals Engineering and
Technology (CIPET): Institute of Petrochemicals
Technology (IPT)**

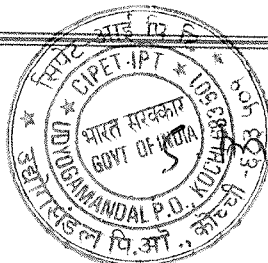
**HIL Colony, Edayar Road,
Pathalam, Eloor, Udyogamandal P.O.,
Kochi-683 501**

Web: www.cipet.gov.in, E-mail: kochi@cipet.gov.in

**Submitted
to**

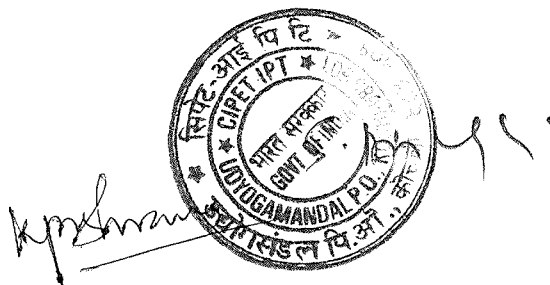


**KERALA STATE POLLUTION CONTROL BOARD
Pattom P.O., Thiruvananthapuram**



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DETAILED TECHNICAL ANALYSIS REPORT

1. PROJECT OUTLINE:

The scope of the work is to evaluate the suitability of the submitted sample for recycling / energy recovery. The sample was subjected to analytical characterization like Differential Scanning Calorimeter (DSC)/ Fourier Transformed Infrared Spectroscopy (FTIR) to identify the materials and further assessments to study the flow behavior of the sample for recycling and the suitability for energy recovery. The samples were subjected to mechanical recycling and the properties of the recyclates were estimated.

2. DEFINITIONS AS PER IS 14534: 2016

Recycling: Processing of plastics waste materials for the original purpose or for other purposes excluding energy recovery.

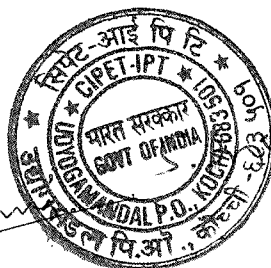
Material Recovery: Material processing operations including mechanical recycling, feedstock (Chemical) recycling and organic recycling, but excluding energy recovery.

Mechanical Recycling: Processing of plastics waste into secondary raw material or products without significantly changing the chemical structure of the material.

Organic Recycling: Controlled microbiological treatment of biodegradable plastics waste under aerobic and anaerobic conditions.

Feedstock Recycling: Conversion to monomer or production of new raw materials by changing the chemical structure of plastics waste through cracking, gasification, or depolymerization, excluding energy recovery and incineration.

Biological recycling: Aerobic (composting) or anaerobic (digestion) treatment of biodegradable plastics waste under controlled conditions using microorganisms to produce, in the presence of oxygen, stabilized organic residues, carbon dioxide, and water or in the absence of oxygen, stabilized organic residues, methane, carbon dioxide, and water.



3. EXPERIMENTAL:

The submitted sample was subjected to the following preliminary analysis in order to assess the recyclability of film.

- Visual Examination
- Separation of Layers
- Identification of Materials by DSC& FTIR
- Recycling through Melt Processing
- Evaluation of Properties of recyclates

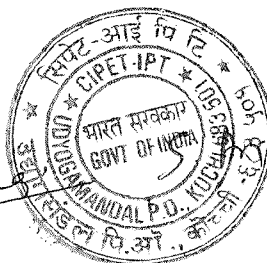
4. RESULTS ANALYSIS

4.1 Visual Examination

S. No.	Test	Test Method / Test Standard	Observations
1.	Visual Examination	-	<ul style="list-style-type: none">• The submitted sample is in the form of sheet.• Sample does not have any printed contents• The submitted sample is white in colour on one side and black in colour on another side• Observed a layer of coating on one side (white) of the sheet.
2.	Overall Mass (GSM)	IS 1964	187 g/m ²

4.2 Separation of layers

S. No.	Test	Test Method / Test Standard	Observations
1.	Separation of Layers	5 strips of size 25 mm x 100 were Immersed in Ethyl acetate for 24 hrs	No layers were separated



4.3 Material Identification

The submitted sample was subjected to DSC and FTIR analysis in order to identify the material of construction in the sample.

4.3.1 Differential Scanning Calorimetry (DSC):

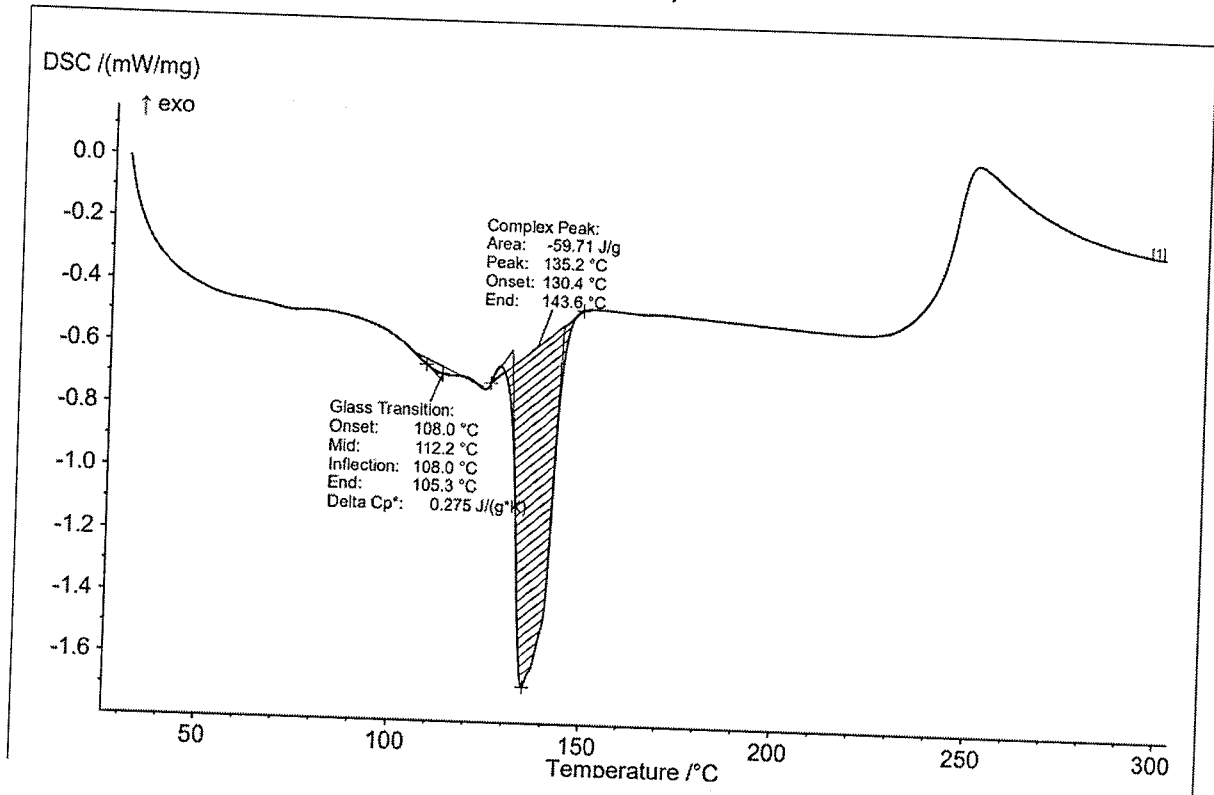
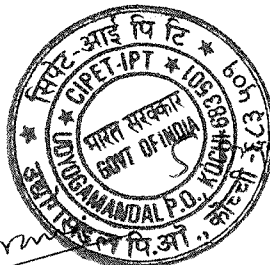


Fig.1. DSC Thermogram of the sheet (As stated by party)

The sample was subjected to DSC analysis in the temperature range of ambient to 300°C at the heating rate of 10°C / min. Fig. 1 depicts the DSC thermo gram of the sample. The endothermic peak at 112.2°C and 135.2°C reveals the melting temperature of Low Density Polyethylene (LDPE) and High Density Polyethylene (HDPE).



S. No.	Test	Test Method	Test results	Inference
1.	Differential Scanning Calorimetry (DSC)	ASTM D 3418	An endothermic Peaks at 112.2°C 135.2°C	Melting temperature of Low Density Polyethylene (LDPE) and High Density Polyethylene (HDPE)

4.3.2 Fourier Transformed Infrared Spectrum

The sheet sample was subjected to Fourier Transformed Infrared (FTIR) studies on both sides of the sheets.

Layer 1 (black colour)

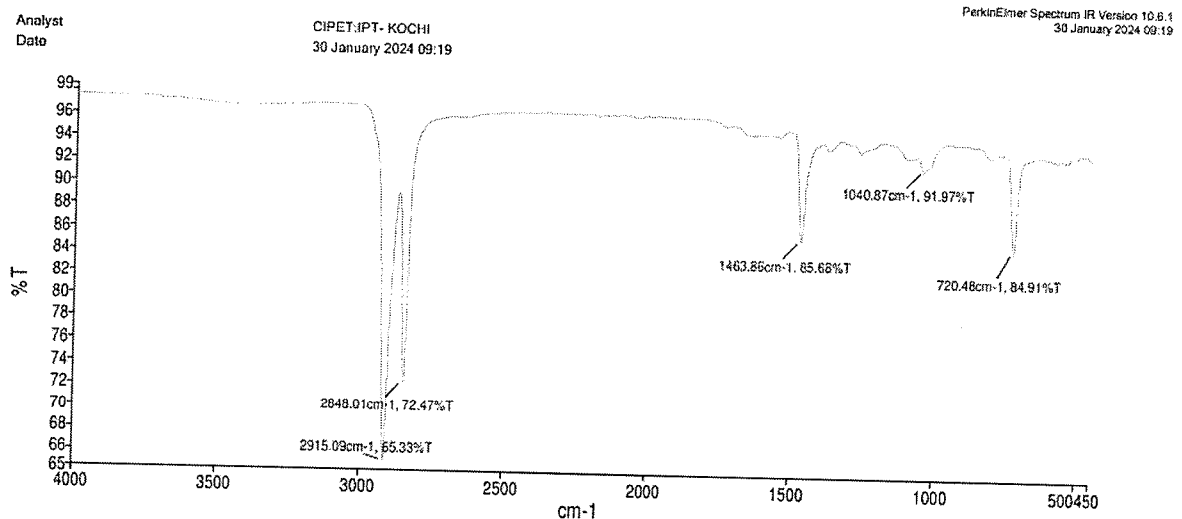
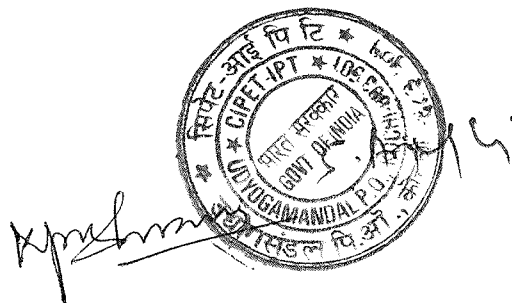


Fig. 2: FTIR spectrum of the submitted sheet (black colour)



Inference:

Fig. 2 shows the FTIR spectrum observed at the surface of the sheet (grey colour). From the above FTIR spectrum the peaks observed at 2915.09 cm^{-1} (CH_2 asymmetric C-H stretching), 2848.01 cm^{-1} (CH_2 symmetric C-H stretching), 1463.86 cm^{-1} (CH_2 deformation), 720.48 cm^{-1} (CH_2 rocking) corresponds to the functional groups of polyethylene. Hence, it is inferred that the submitted sheet sample consist of Polyethylene. Further, no peak corresponds to chlorine is observed. Hence, it is inferred that the sample does not contains PVC.

Layer 2 (white colour)

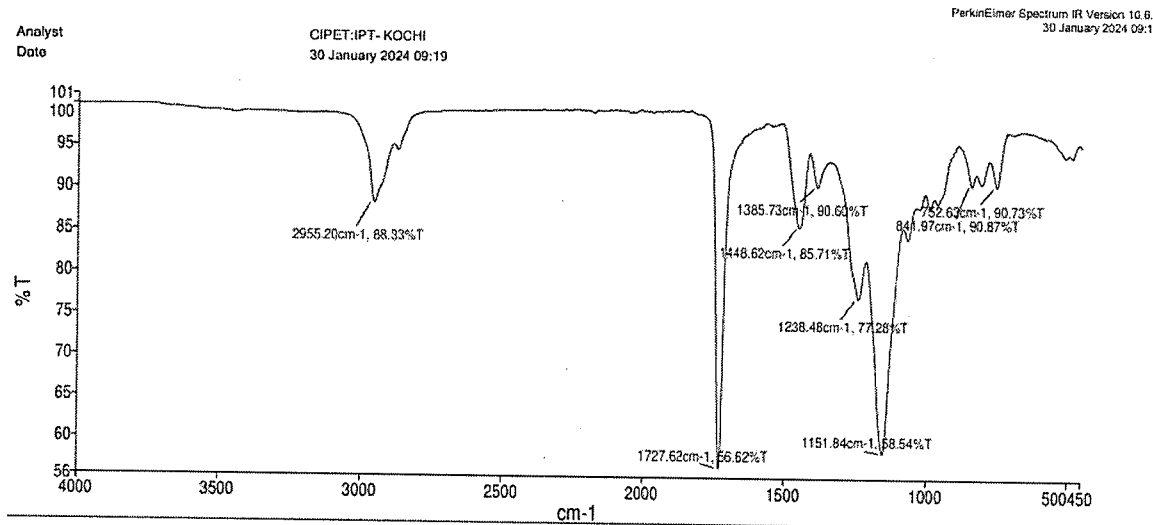


Fig. 3: FTIR spectrum of the submitted sheet (white colour)

Inference:

Fig. 3 shows the FTIR spectrum observed at the surface of the sheet (Coated side). The two major peaks observed at 1727.62 cm^{-1} and 1151.84 cm^{-1} are attributed to C=O stretching and C-O-C asymmetrical stretching, which confirms the presence of acrylic emulsion as coating. Further, no peak corresponds to chlorine is observed. Hence, it is inferred that the sample does not contains PVC.



4.4. Mechanical Recycling:

4.4.1 Melt processing and granulation

The submitted sample was subjected to mechanical recycling through melt processing technique. The sheet sample in the existing format was fed into the feed zone of the twin screw extruder. The optimal temperature was set in each heating zone of the extruder. The molten extruder was subjected to cutting for further conversion to granules. Fig. 4 shows the conversion of submitted sheet sample to recycled granules through mechanical recycling.

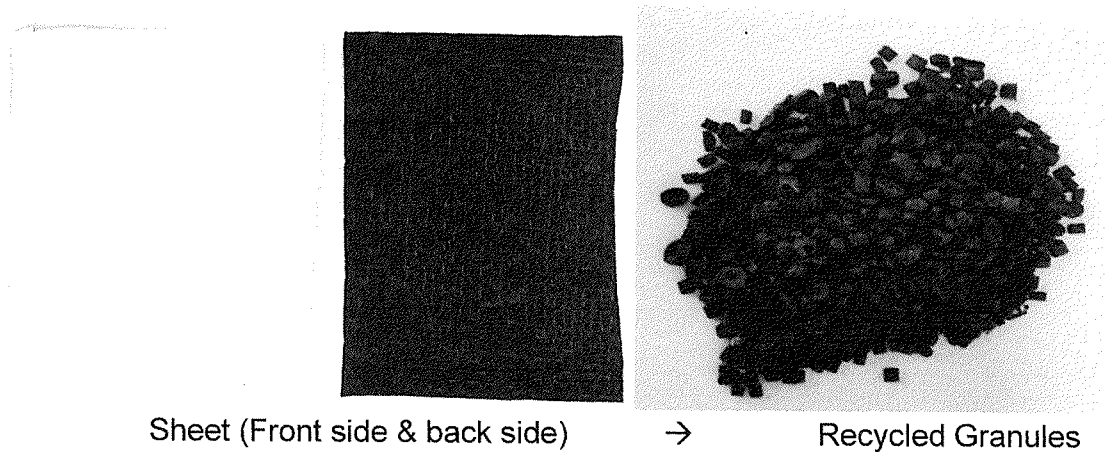


Fig. 4: Recycled Granules from sheet sample

4.4.2 Specimen Preparation

The recycled granules were converted into test specimens using Injection moulding process in order to determine the properties of the recyclates. Fig. 5 shows the molded test specimen from the recycled granules.

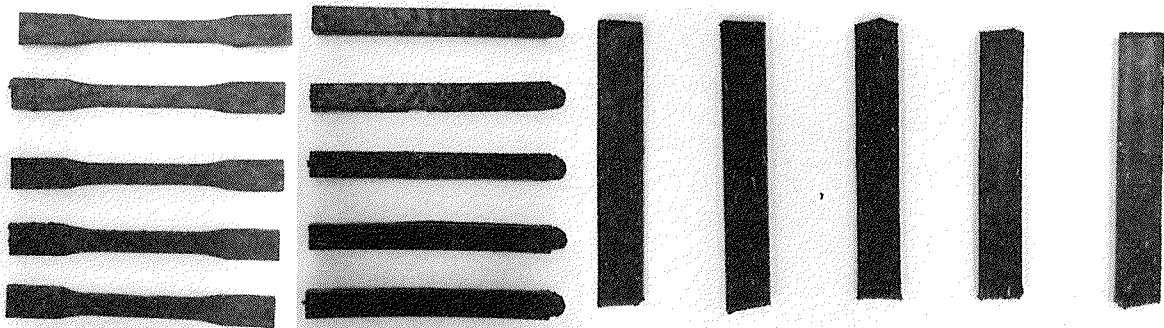


Fig. 5: Molded test specimen from Recycled Granules

Fig. 5: Molded test specimen from Recycled Granules


The following properties were determined on the recyclate obtained from mechanical recycling of submitted sample of sheet used for banner and hording.

Sl. No	Name of test	Testing Method	Unit	Results obtained
01	Tensile strength	ASTM D 638	MPa	11.83
02	Elongation at break	ASTM D 638	%	236
03	Flexural strength	ASTM D 790	MPa	10.93
04	Melt Flow Index (190C/2.16kg)	ASTM D 1238	g/10 minutes	1.10
05	Izod Impact Strength (Notched)	ASTM D 256	kJ/m ²	8.50

5. SUMMARY AND CONCLUSION:

- Visual examination confirms that the submitted sample in sheet form, does not contains any printing and the sheet is white in colour.
- FTIR and DSC reveal that the sheet sample is made of Low Density Polyethylene (LDPE) and High Density Polyethylene (HDPE) with a thin layer of acrylic emulsion coating.
- Further, there is no evidence of chlorine in the sample, confirming the absence of PVC.
- The melt processing confirms the feasibility of mechanical recycling of the submitted sample of sheet in the existing format.

Hence, it is concluded that the submitted sample of "Material for banner and hoarding" (*as stated by party*) comprises of Low Density Polyethylene (LDPE) and High Density Polyethylene (HDPE) with thin coating layer of acrylic emulsion is suitable for Mechanical recycling (in the existing format) as per IS:14534-2016.


Dr. K.P. Bhuvana
 Authorized Signatory


Dr. S. Anbudayanidhi
 Authorized Signatory

*****End of the report*****

