

# TEST REPORT



Test Report No. GGN/H(FCM)/23/000679

Dated 2023.08.09

## Sample Image(s) (As Received)



Paper Cup

# TEST REPORT



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Dated 2023.08.09

**Applicant / Company Name** : LEETHA PACK PVT LTD  
**Address** : Major Industrial Estate , South Kalamassery  
: Kochi - 683104, KERALA. INDIA  
**Attention / Contact Person** : Don Mathews  
**Tested Sample** : Received On 2023.03.27 At 11:23 A.M.  
**Test Period** : 2022.03.27 To 2023.08.08(\*\*)  
**Article / Sample Description** : Paper Cups  
**Country Of Destination** : India

*Note: The submitted sample(s) is / are Not Drawn by the Laboratory*

*NOTE: Unless otherwise agreed upon, Pass or Fail or Statement of compliance verdicts are given based on the measured values without any considerations of measurement uncertainties. Every test method has a measurement uncertainty which has been evaluated by the laboratory and are available on request. By taking measurement uncertainties into account it might happen that measured values can neither be assessed as Pass nor as Fail.*

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Note: The test report is electronically generated. Hence original signature is not required.

Note: (1) The results relate only to the items tested, (2) The test report shall not be reproduced except in full without the written approval of the laboratory (3) Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details, please see testing and certification regulation, chapter A-3.4. (4) The correctness of the information related to sample(s) in the Test Request Form/Customer letterhead/Email is the customer's responsibility. The laboratory reports the said information in the test report and is not liable for the same, (5) The testing conditions are followed as per the reported test standard. For additional test conditions apart from the reported test conditions laboratory can be contacted for details

Laboratory:  
TÜV SÜD South Asia Pvt. Ltd.  
373 Udyog Vihar Phase II  
Sector 20  
Gurgaon – 122016

Phone : +91 (124) 6199699  
Email :  
[Anuradha.Dhamija@tuvsud.com](mailto:Anuradha.Dhamija@tuvsud.com)  
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Registered Office:  
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Off Saki Vihar Road  
Saki Naka, Andheri (East),  
Mumbai – 400072. India

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## Remarks:

1. Sample(s) is / are tested as on-received basis.
2. Test(s) performed as requested by applicant.
3. Conclusion(s) of the test(s) was drawn as per compliance requirement(s) specified by applicant.
4. (\*\*) Test report was released after getting all the mandatory information from the applicant.
5. This test was carried out by external laboratory assessed as competent.
6. This report is for internal use only such as internal scientific research, education, quality control, product R&D.

## Authorized By

Anuradha Dhamija  
(Authorised Signatory)

## Please Contact:

For any technical issues: Anuradha Dhamija at [Anuradha.Dhamija@tuvsud.com](mailto:Anuradha.Dhamija@tuvsud.com)

For any complaint: Ashima Sapra at: [Ashima.Sapra@tuvsud.com](mailto:Ashima.Sapra@tuvsud.com)

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## Summary of Test Result(s)

| S. No.                                                                                                                | Test(s)                               | Conclusion (#) |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------|
| 1.                                                                                                                    | Biodegradability as per ASTM D6400-19 | Pass           |
| (# ) For details regarding specification(s) / regulation(s) based on which compliance is decided, refer test details. |                                       |                |

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## Test Result(s):

### Biodegradation test

| Test Item                                                                                                                                                                                                                                      | Technical specification requirements (%) | Test Result (%) | Conclusion(s) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|---------------|
| The degree of biodegradation                                                                                                                                                                                                                   | /                                        | 81.7            | /             |
| Relative biodegradation rate                                                                                                                                                                                                                   | 90                                       | 93.9            | conformity    |
| Note: Calculate the average relative biodegradation rate, the average relative biodegradation rate of the test sample = the average biodegradation rate of the test sample ÷ the average biodegradation rate of the reference material × 100%. |                                          |                 |               |

### Basic Information of Experiment:

| Item                            | Content                                                                                                                                                                               |                       |              |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|
| Test Vessel Volume              | 2L                                                                                                                                                                                    | Test Conditions       | 58°C±2°C     |
| Age of the Compost              | 3 months                                                                                                                                                                              | Source of the Compost | Self-control |
| Test method for carbon dioxide  | The Barium hydroxide absorption method was titrated with HCl standard solution.                                                                                                       |                       |              |
| Reference Standards and Methods | ASTM D5338-15 (2021) Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions. Incorporating Thermophilic Temperatures |                       |              |

### Reference information:

| The reference category                                                                             | Number | Lot Number | Total dry solids (%) | Total organic carbon (%) |
|----------------------------------------------------------------------------------------------------|--------|------------|----------------------|--------------------------|
| Positive Reference Material<br>TLC (thin-layer chromatography)<br>grade cellulose microcrystalline | M22001 | 20220530   | 97.0                 | 42.46                    |
| Negative Reference Material<br>(Polyethylene film)                                                 | M21008 | 20210601   | 99.8                 | 83.01                    |
| Note: /                                                                                            |        |            |                      |                          |

### Basic Information of Sample:

| Sample Category | Total dry solids (%) | Total organic carbon (%) |
|-----------------|----------------------|--------------------------|
| Test Item       | 91.6                 | 42.32                    |

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## Determination of the Validity of Test Result(s):

1. The degree of biodegradation, relative deviation, Confidence Limit and Observation of reference and sample item at the end of the experiment (90 days)

| Positive Reference Material Number | The degree of Biodegradation (%) | Relative Deviation (%) | 95 % Confidence Limit, % | Observation                                                                                                                                                           |
|------------------------------------|----------------------------------|------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parallel Sample 1                  | 87.1                             | 0.0                    | ±3.1                     | The results showed that the positive reference substance was obviously degraded after 4 days, and there was no white powder state and no rancid smell.                |
| Parallel Sample 2                  | 87.4                             |                        |                          |                                                                                                                                                                       |
| Parallel Sample 3                  | 86.7                             |                        |                          |                                                                                                                                                                       |
| Mean of three runs                 | 87.1                             | /                      | ±3.1                     |                                                                                                                                                                       |
| Negative Reference Material Number | The degree of Biodegradation (%) | Relative Deviation (%) | 95 % Confidence Limit, % | Observation                                                                                                                                                           |
| Parallel Sample 1                  | 3.47                             | 0.7                    | ±3.0                     | The negative reference material was white granule, no obvious mold growth and no obvious disintegration.                                                              |
| Parallel Sample 2                  | 3.32                             |                        |                          |                                                                                                                                                                       |
| Parallel Sample 3                  | 3.39                             |                        |                          |                                                                                                                                                                       |
| Mean of three runs                 | 3.39                             | /                      | ±3.0                     |                                                                                                                                                                       |
| Test Sample number                 | The degree of Biodegradation (%) | Relative Deviation (%) | 95 % Confidence Limit, % | Observation                                                                                                                                                           |
| Parallel Sample 1                  | 82.2                             | 0.2                    | ±3.1                     | 721679644-2 is a white solid. On the 24 <sup>th</sup> day, the edge of the sample was worn, and a small part of the sample disintegrated on the 38 <sup>th</sup> day. |
| Parallel Sample 2                  | 80.7                             |                        |                          |                                                                                                                                                                       |
| Parallel Sample 3                  | 82.3                             |                        |                          |                                                                                                                                                                       |
| Mean of three runs                 | 81.7                             | /                      | ±3.1                     |                                                                                                                                                                       |

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## 2. The Test Result(s)

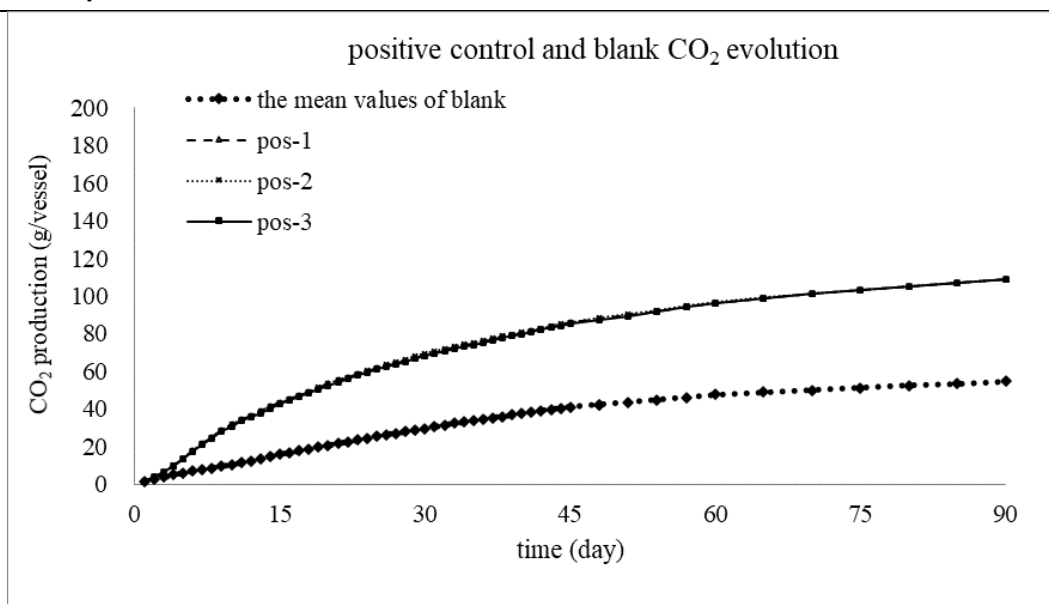
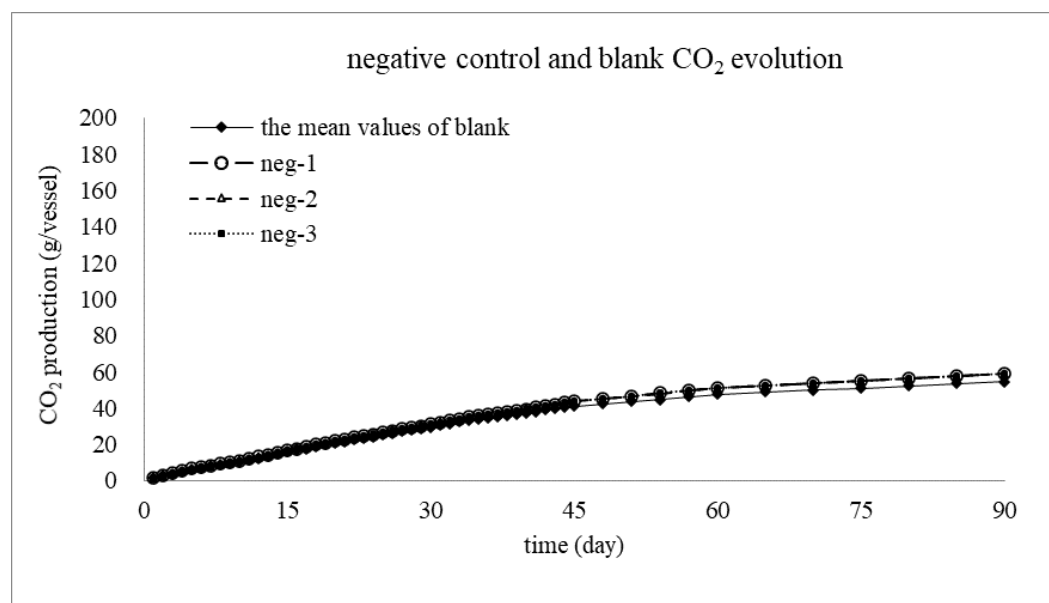
| Sample Category             | The theoretical amount of carbon dioxide of 10d/volatile solids (mg/g) | The degree of biodegradation of 45d (%) | The ultimate biodegradation (90 days) at the end of the experiment (%) |
|-----------------------------|------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| Blank                       | 147.2                                                                  | /                                       | /                                                                      |
| Test Item                   | /                                                                      | 53.4                                    | 81.7                                                                   |
| Positive Reference Material | /                                                                      | 71.7                                    | 87.1                                                                   |
| Negative Reference Material | /                                                                      | 2.21                                    | 3.39                                                                   |

## 3. Validity Determination

| Judgment Basis and Requirements   | The inoculum in the blank has produced more than 50 mg but less than 150 mg of carbon dioxide per gram of volatile solids (mean values) after 10 days of testing. | The degree of biodegradation of the positive reference item is more than 70% after 45 days of testing. | The differences of percentage biodegradation between the individual values of three replicates for positive reference item were less than 20% at the end of test. |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Whether it meets the requirements | YES                                                                                                                                                               | YES                                                                                                    | YES                                                                                                                                                               |

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Carbon Dioxide Emissions and Biodegradation Graphs**(1) The Graph of the Carbon Dioxide Released**Fig. 1: positive reference material and blank (90 days) CO<sub>2</sub> evolution curveFig.2: negative reference material and blank (90 days) CO<sub>2</sub> evolution curve

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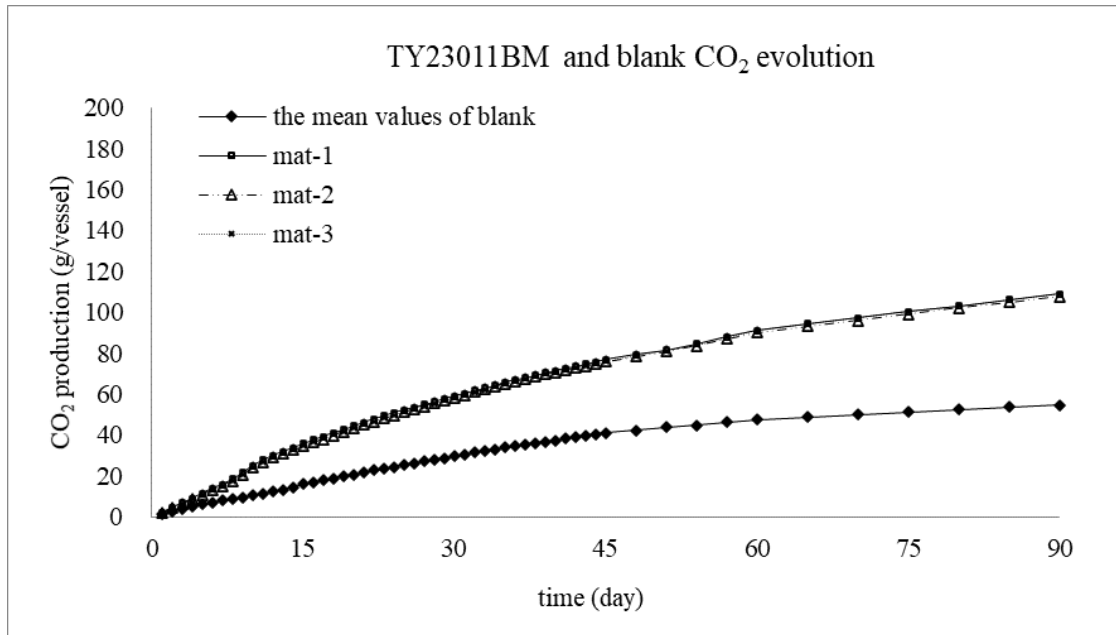


Fig.3: 721679644-2 and blank (90 days) CO<sub>2</sub> evolution curve

## (2) The Graph of Bio decomposition

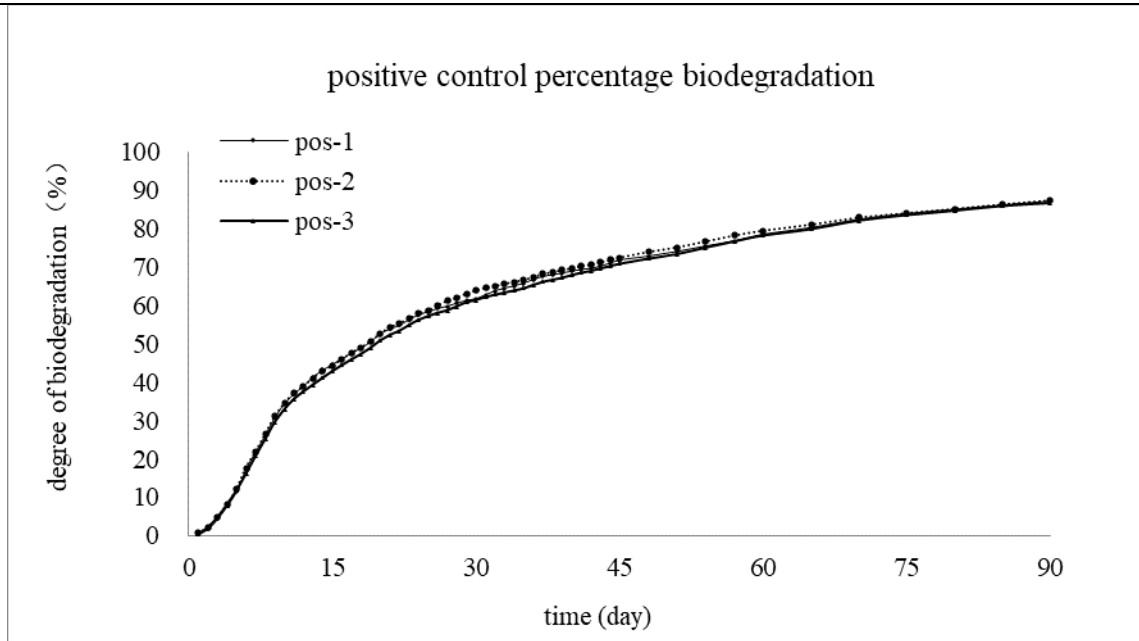


Fig.4: positive reference material (90 days) percentage biodegradation curve

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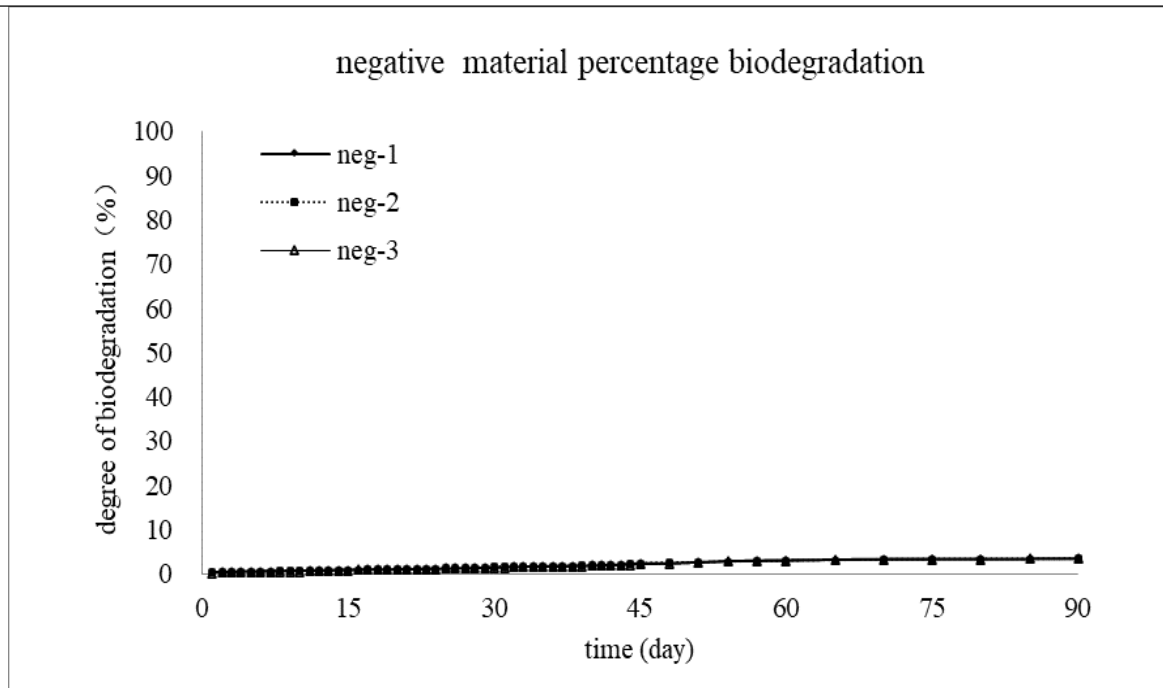


Fig.5: negative reference material (90 days) percentage biodegradation curve

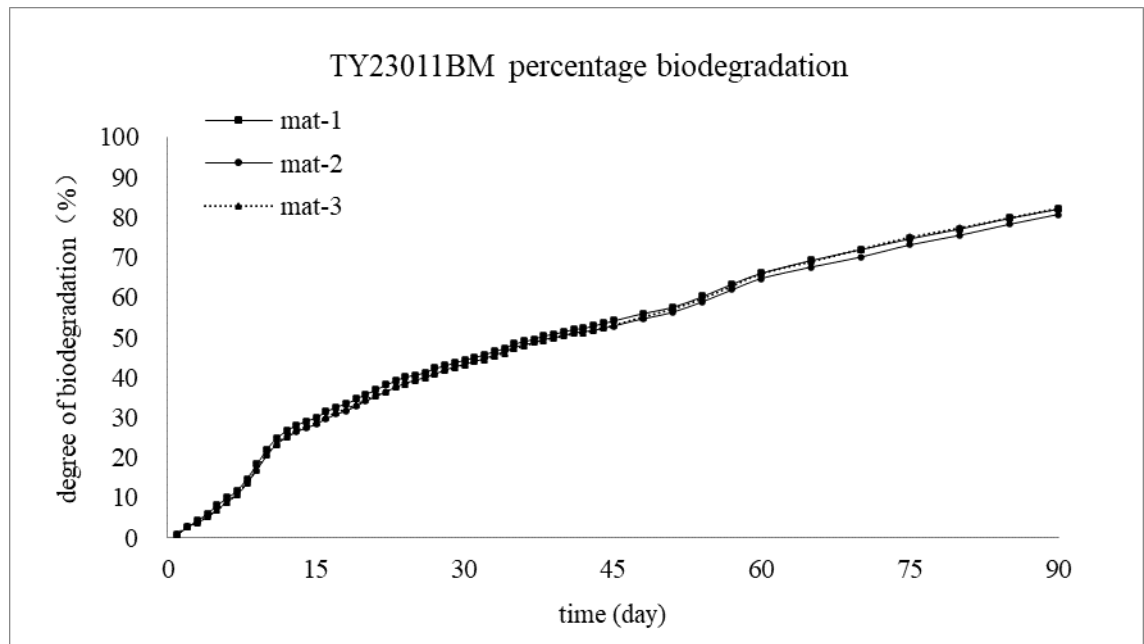


Fig. 6: 721679644-2 (90 days) percentage biodegradation curve

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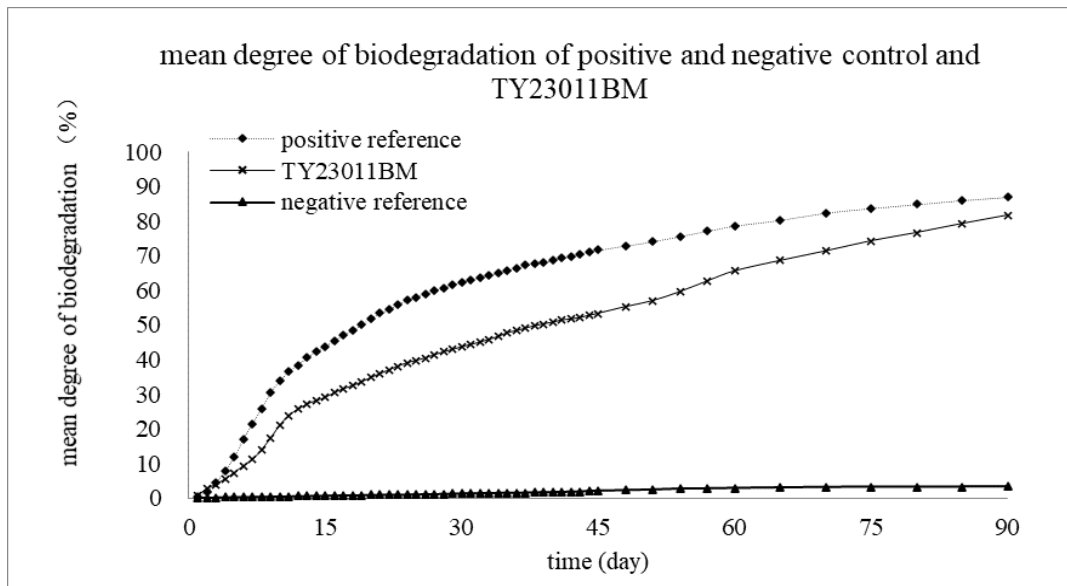


Fig.7: The mean values (90 days) of percentage biodegradation curve of positive and negative referencematerial and 721679644-2

**8. Sample Test Picture:** (Note: The color of the sample may deviate from their pictures due to lighting and the use of different monitors.)



Fig.8. The picture of 721679644-2

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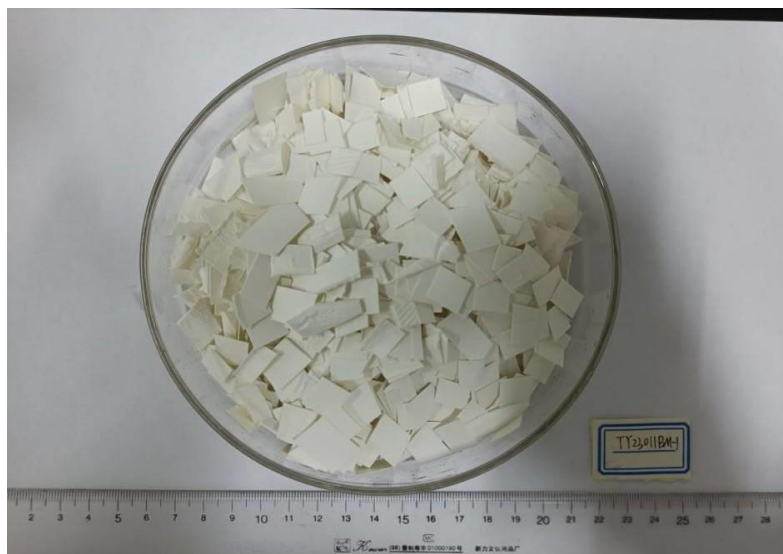


Fig. 9. The picture of 721679644-2 before test



Fig.10. The picture of 721679644-2 and compost before test (mat -1)

--- END OF THE TEST REPORT ---