

IMSYS Engineering Service Ltd. Head office: 1033 Budapest, Mozaik street 14/A Site: 5100 Jászberény, Necső telep 1. Phone: (+36) 1 430 0014 www.imsys.hu 	Test report Material Testing Laboratory	Testing laboratory accredited by NAH under No. NAH-1-1830/2023.
Version: 1.3. (27.04.2023)		Identification number: AFN-7.08.01-A
		Contract number: 174/2025.
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TEST REPORT

Client: AVE ROMÂNIA SRL

Date of releasing test report: 16. 06. 2025

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1. TEST SAMPLE

Sample: plastic granules

ID (Figure 1): LDPE-NATUR
LDPE-COLOR

Date of sample receiving: 12. 06. 2025



Figure 1: Samples received for testing

2. CLIENT

Name: AVE ROMÂNIA SRL

Address: str. Matei Corvin, nr.100, Oradea, 410142, jud. BH, România

3. TESTIS CARRIED OUT BY

Name: Imsys Kft. Material Testing Laboratory

Address: 1. Necső telep, 5100 Jászberény

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4. PURPOSE OF THE TEST

The purpose of the test was to investigate the samples provided by the Client with the following methods:

- Fourier transform infrared spectroscopy – FTIR test – ATR test *,
- DSC test according to MSZ EN ISO 11357-1 2017 (withdrawn) standard and MSZ EN ISO 11357-3:2018 standard,
- Density test according to MSZ EN ISO 1183-1:2019 standard, method A,
- Melt flow rate test according to MSZ EN ISO 1133-1:2022 standard,
- Moisture content examination based on MSZ EN ISO 15512:2019 standard *.

5. TEST CONDITIONS

5.1. DATE OF THE TEST

13. 06. 2025

5.2. EQUIPMENTS

Infrared spectrometer: Bruker, Tensor 37

Serial number: 401

Date of calibration: 13. 12. 2024

Differential scanning calorimeter: Setaram, DSC 131 EVO

Serial number: LCT24349/01

Date of calibration: 25. 08. 2023

Analytical balance: Radwag AS 60/220.R2

Serial number: 485400

Date of calibration: 19. 10. 2023

Melt flow index tester: Dynisco, LMFI-2LENNCN

Serial number: 206FAF6242

Date of calibration: 09. 02. 2024

Moisture content analyser: Aboni Hydrotracer FMX

Serial number: FLV KM 0716 1415

Date of calibration: 10. 08. 2024

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5.3. TESTING CONDITIONS

5.3.1. FTIR

Specimen:	granules
Detector:	ATR
Number of background spectra:	16
Number of sample spectra:	16
Wavelength range:	400 – 4000 1/cm
Resolution:	4 1/cm

5.3.2. DSC

Specimen:	granules
Program:	heating
Temperature range:	20 – 320 °C
Heating rate:	10 °C / min
Atmosphere:	nitrogen
Sample weight:	10 – 11 mg

5.3.3. Density test

Specimen:	granules
Method:	A (immersion)
Test temperature:	23 °C
Immersion liquid:	ethanol
Number of measurements:	3

5.3.4. Melt flow rate

Specimen:	granules
Test temperature:	190 °C
Weight:	21.6 kg
Melting time:	300 s
Cutting time:	10 s

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Number of cuts: 3

Number of measurements: 3

5.3.5. Moisture content

Specimen: granules

Sample weight: 10 – 12 g

Test temperature: 130 °C

Reagent: calcium-chloride

6. SUMMARY OF THE TEST RESULTS

6.1. FTIR TEST

The spectra recorded during the FTIR analysis are shown in **Figure 2**. Both samples show good agreement with the characteristic spectrum of polyethylene (PE).

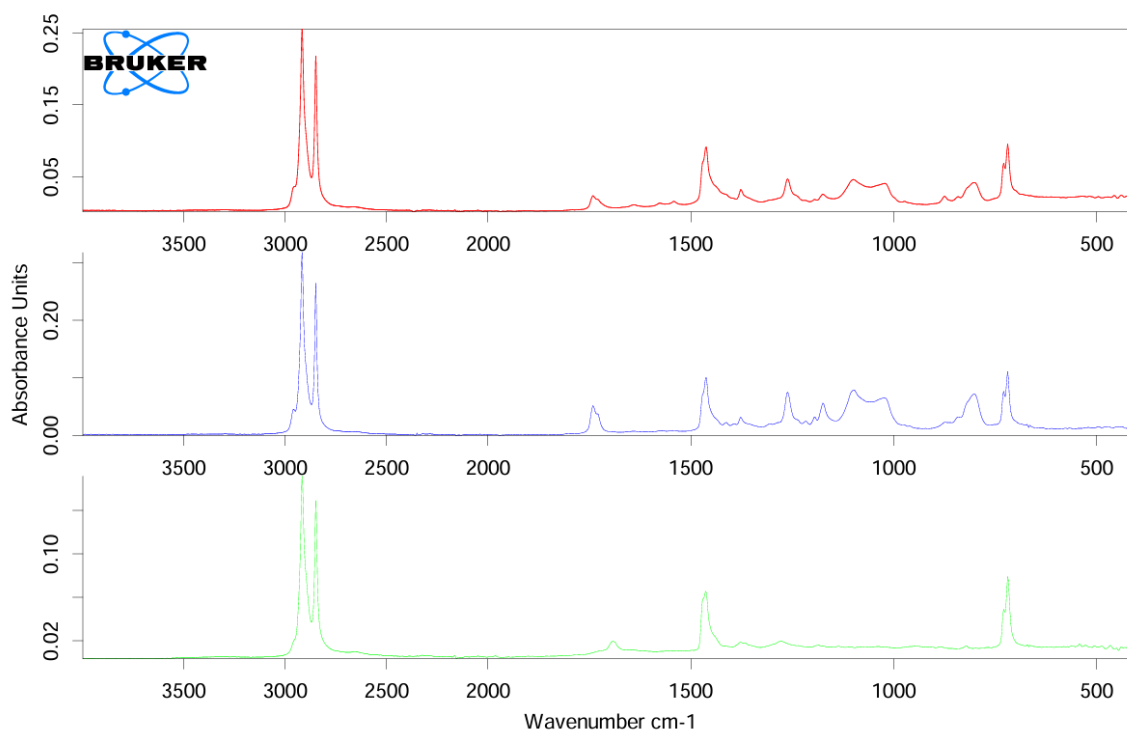


Figure 2: FTIR spectra of the samples: LDPE-COLOR (red), LDPE-NATUR (blue) and a reference polyethylene (green)

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6.2. DIFFERENTIAL SCANNING CALORIMETRY (DSC)

The results of the DSC measurements are presented in **Figures 3–6**. Multiple peaks can be observed in both curves, indicating the presence of different types of polymers in the samples. The peaks were deconvoluted into sub-peaks to determine their melting peak temperatures. A small peak observed around 70–80 °C likely corresponds to ethylene-vinyl acetate (EVA), the two main peaks at approximately 120 °C and 128 °C is attributed to low-density polyethylene (LDPE) and high-density polyethylene (HDPE), while the small peak around 165 °C suggests the presence of polypropylene (PP).

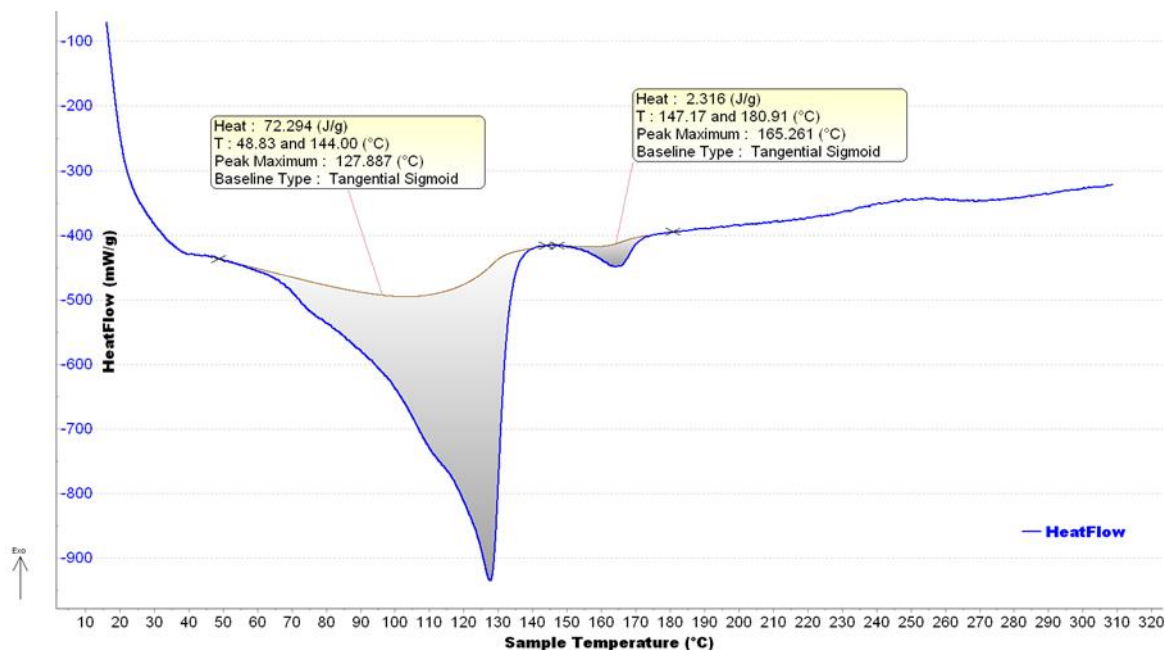


Figure 3: DSC curve of LDPE-NATUR



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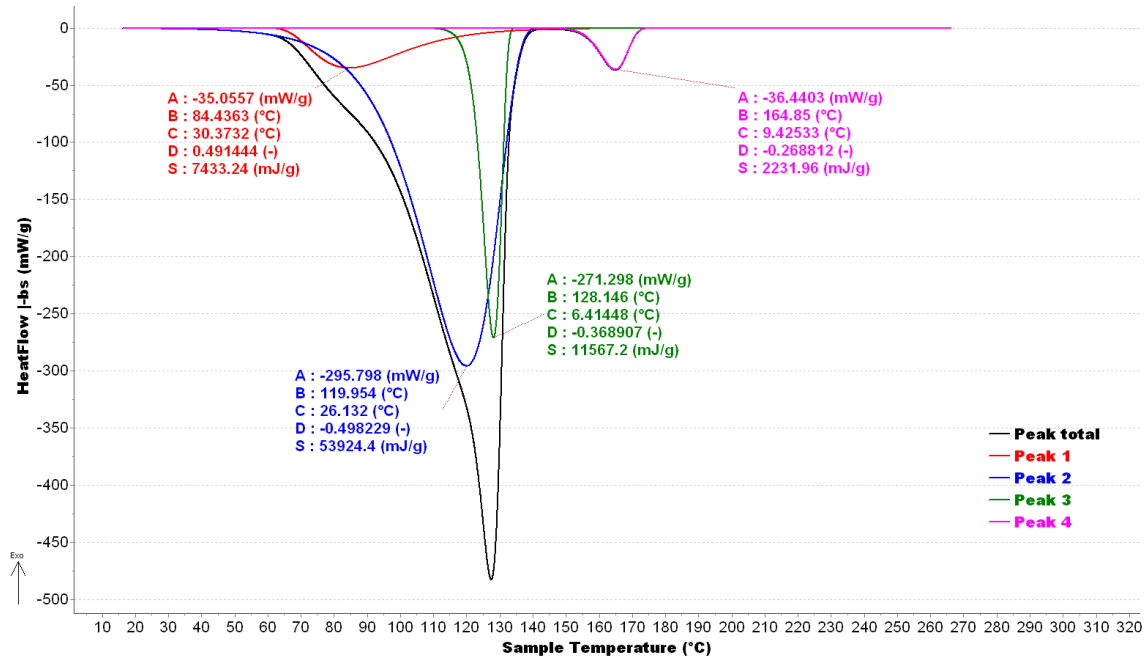


Figure 4: DSC curve of LDPE-NATUR with peak separation

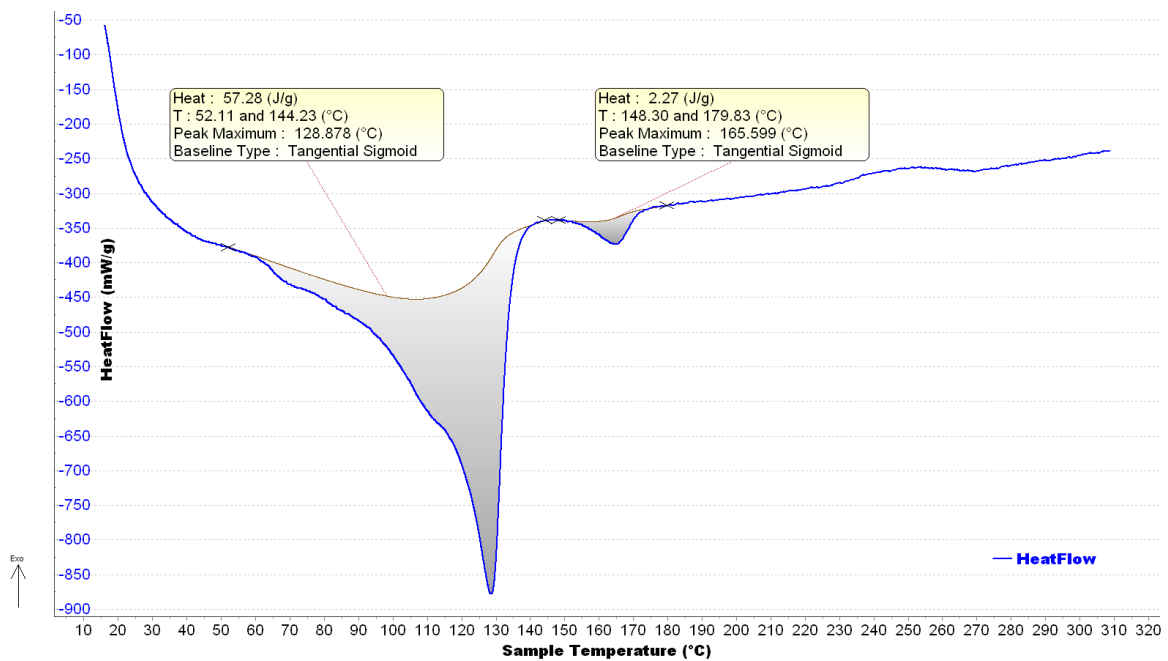


Figure 5: DSC curve of LDPE-COLOR



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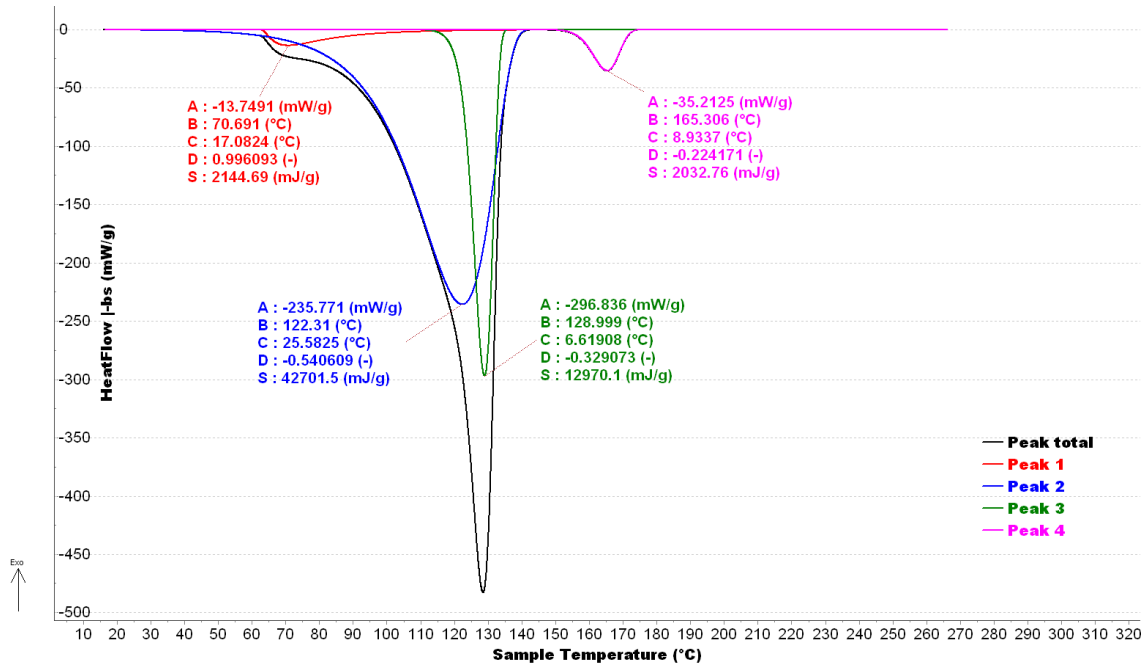


Figure 6: DSC curve of LDPE-COLOR with peak separation

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6.3. DENSITY MEASUREMENT

The density of the samples is summarised in **Table 2**.

Table 2: Density values

Number of measurements	Density of LDPE-NATUR [g/cm³]	Density of LDPE-COLOR [g/cm³]
1	0.928	0.941
2	0.927	0.949
3	0.930	0.949
Mean	0.929	0.946
SD	0.001	0.004

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6.4. MELT FLOW RATE (MFR)

The results of the melt flow rate test are presented in **Table 3**.

Table 3: Melt flow rate results

Number of measurements	Melt mass-flow rate of LDPE-NATUR [g/10 min]	Melt mass-flow rate of LPDE-COLOR [g/10 min]
1	35.7	33.5
2	33.2	29.6
3	34.6	30.1
4	36.6	32.5
5	33.1	29.6
6	34.4	30.2
7	36.5	33.8
8	33.1	30.7
9	34.0	30.7
Mean	34.6	31.2
SD	1.4	1.7

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6.5. MOISTURE CONTENT

The moisture content of the samples is summarised in **Table 4**.

Table 4: Moisture content

Moisture content of LDPE-NATUR [%]	Moisture content of LDPE-COLOR [%]
0.032	0.085

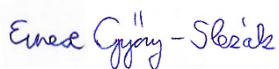
*: not accredited examination

The test results presented in this report relate only to the sample/specimen tested.

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The test was accomplished by:

Verified by:



Emese Győry-Slezák

Testing engineer



Dr. Ferenc Ronkay, PhD.

Head of laboratory