Roediger Agencies cc

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17 November 2020

Brendon Kruger
EKM Exports/Gogo Fruit
Lombardy Business Park
Unit 75 & 76
Graham & Cole Road
0081 SHERE

Dear Mr. Kruger

REF no.: 1611CAS1/2

A netting sample was sent to the analytical laboratory of Roediger Agencies cc for analysis via the following test methods.

The sample was labelled:

- Hail net 60GSM 6% UV 20% Shade rate.

Determination of Hindered Amine Light Stabilisers (HALS) in polyolefins by UV spectroscopy – (CAS no. 71878-19-8 / 106990-43-6 / 192268-64-7

Approximately 1 g of the sample is dissolved in hot Decalin (Decahydronaphthalene) and allowed to cool. This suspension is then poured into a separating funnel containing 100 mL of an acidic solution. The solution is shaken and allowed to stand for approximately 2 hours whereby the bottom layer which contains the HALS stabiliser is subjected to the UV/VIS spectrophotometer and compared to a known concentration of HALS stabiliser. The UV conditions are stated below.

Spectrometer:	Analytica Jena
Model:	Spekol 2000
Mode:	Absorbance
Absorbance range:	0 to 1.5
Wavelength range:	340 to 200 nm
Scan speed:	120 nm/min
Cell:	10 mm quartz
Reference solution:	Solution A

Determination of HALS stabilisers in polyolefins using High Performance Liquid Chromatography (HPLC) – (CAS no. 65447-77-0)

Approximately 1 g of the sample is extracted with a solvent and precipitated with a methanol solution. The sample is then filtered, evaporated and left to cool. 10 mL of 2:1 n-hexane/ethanol solution is added to the sample, filtered and then introduced into the HPLC. The conditions are stipulated below.

Instrument: Gradient pumping system with UV detection

Column: Zorbax NH_2, 4.6 x 250 mm

Mobile Phase: A = 93/7 n-Hexane / Ethanol

Flow rate: 2 mL/minute

Column temperature: 40 °C

Detection: 210 nm

Injection volume 20 µl

Sample	CAS no. 71878-19-8 (HALS stabiliser) Chimassorb®944/generic (%)	CAS no. 65447-77-0 (HALS stabiliser) Tinuvin®622/generic (%)	Total UV stabiliser (%)
Hail net 60GSM 6% UV 20% Shade rate	0.39	0.35	0.74

DSC

Differential scanning calorimetry (DSC) is a technique used to study what happens to polymers when they are heated; it is used to study the thermal transitions of a polymer. These include the melting of a crystalline region within a polymer and the glass transition.

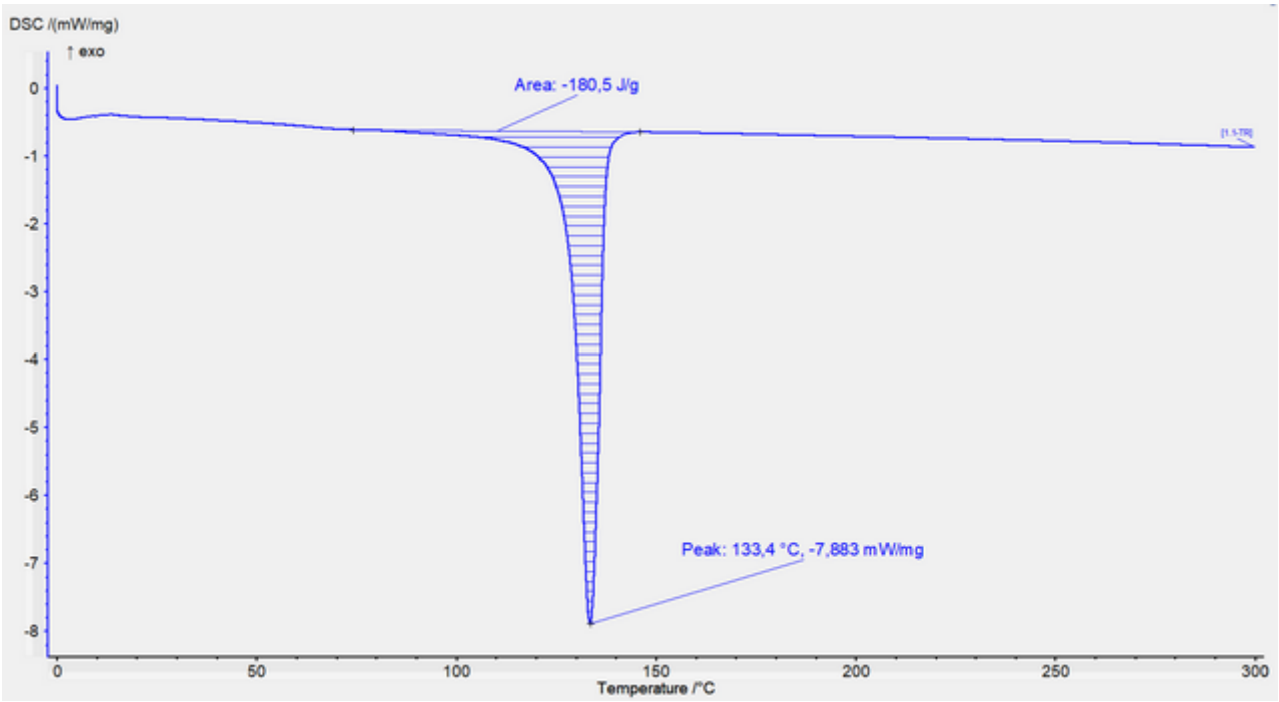
The melting of a crystalline region is usually accompanied by an endotherm, which is represented by a peak on the thermogram of heat capacity vs. temperature of the sample. The temperature at the lowest point of the dip is usually considered to be the polymer's melting temperature, or Tm. The latent energy of crystallization of a polymer can be calculated by measuring the area of the dip. The percentage crystallinity of the polymer sampled can then be determined by comparing this to the amount of latent heat required to melt a 100% crystalline polymer. In the case of HDPE it is 293 J/g and in the case of PP it is 207 J/g.

The melting point of amorphous polymers cannot be determined by DSC analysis since they have no crystalline regions.

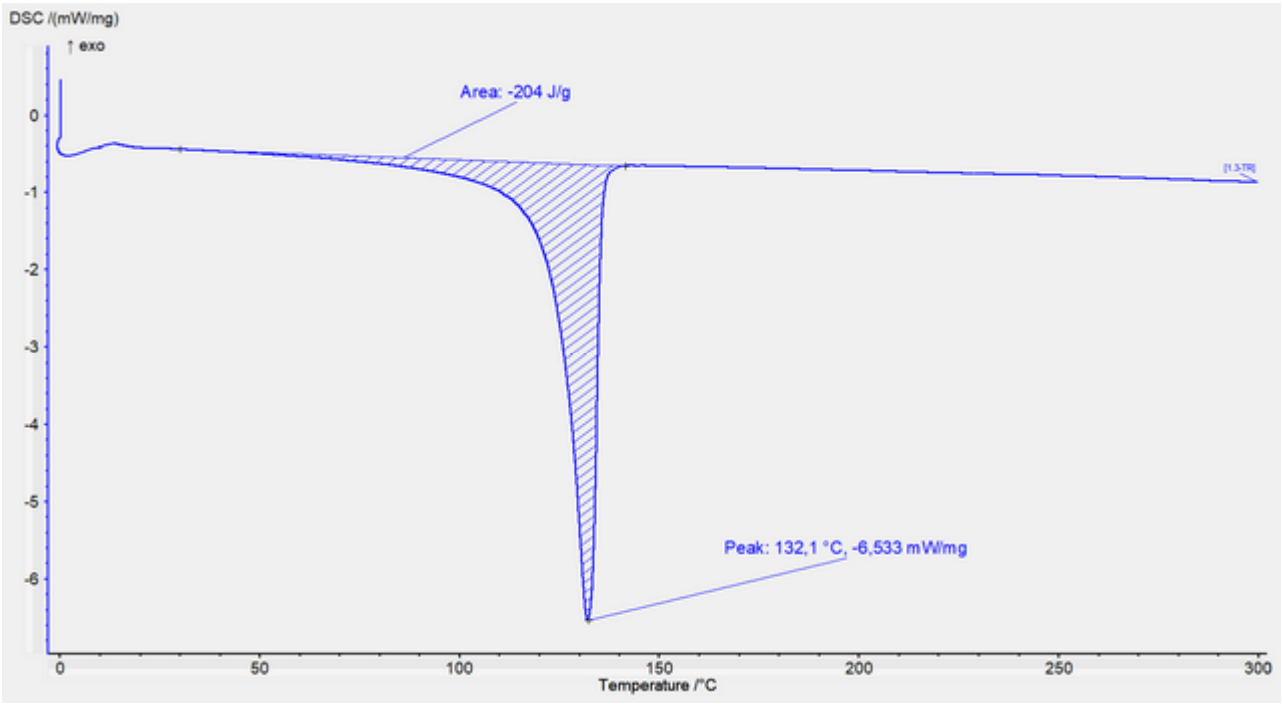
In order to determine the exact melting point of a polymer and its percentage crystallinity a sample is heated to above the melting point and subsequently cooled, at a controlled rate before reheating the sample and conducting the measurements. A constant heating rate is used throughout the entire process; it is usually 20°C/min. This heating process removes any thermal stresses that may have been induced to the polymer during manufacture and allows it to recrystallise under controlled conditions during the cooling cycle.

The type of polymer (e.g. – low density polyethylene) can be determined from its melting point and the percentage crystallinity, calculated from the area of the melting peak relative to the mass of the sample.

DSC analysis was carried out in a Netzsch Polyma DSC 214 calibrated with indium, lead and zinc standards. All tests are performed in sealed aluminium pans after recording the weight to a ±10 μg precision. In the case of glass transition determinations the weight is not recorded.



Hail net – 1st heating run



Hail net – 2nd heating run

Sample	Heating	Melting point (°C)	ΔH (J/g)	Polymer ID
Hail net 60GSM 6% UV 20% Shade rate	1st	133.4	180.5	HDPE
	2nd	132.1	204.0	

GSM

GSM (gram per square meter) or grammage is the weight of a sample expressed as gram per square meter. Pieces of a known area was punched from various places on the sample. The punches were weighed on a 5 decimal balance and the grammage was calculated. An average of the calculations were used.

Sample	Grammage (g/m²)
Hail net 60GSM 6% UV 20% Shade rate	59
	61
	60
Average	**60**

Tensile tests – strength & elongation

Tensile properties were measured on a tensile strength testing machine with a moving jaw of 50 ± 5 mm per minute.

Methods: In case of rigid materials ASTM D638-14; in case of thin sheeting ASTM D882-12.

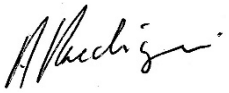
Clamping jaws for netting

Hail net 60GSM 6% UV 20% Shade rate	Strength (N/m)	Allowed (N/m)	Elongation (%)	Allowed (%)	Pass/fail
Warp	800	803 ±5%	31	30 ±5%	Pass
Weft	865	886 ±5%	37	36 ±5%	Pass

Summary

Sample	CAS no. 71878-19-8 (HALS stabiliser) Chimassorb®944/generic (%)	CAS no. 65447-77-0 (HALS stabiliser) Tinuvin®622/generic (%)	Total UV stabiliser (%)	Polymer ID	Grammage (g/m²)	Strength (N/m)		Elongation (%)	
						Warp	Weft	Warp	Weft
Hail net 60GSM 6% UV 20% Shade rate	0.39	0.35	0.74	HDPE	60	800	865	31	37

Yours faithfully,



Dr. AHA Roediger.

Please take note that samples will be retained for a one year period and discarded thereafter.