



Certificate of Preparation – Batch #036-2

14 polymers-CaCO₃ blend (10 µg/mg; 1% w/w)

This Certificate of Preparation (COP) provides information on the composition and preparation of the polymer reference material intended for use in the pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS) applications.

Table of contents

1. Composition and preparation.....	2
1.1. Polymers	2
1.2. Diluent.....	4
1.3. Preparation of polymers-diluent blend.....	4
2. Sample contents.....	5
2.1. Stock mixture.....	5
2.2. Batch #036-2.....	6
3. Contamination control.....	7
4. Disclaimer	7
4.1. Support	7
Abbreviations.....	8
Units	8



1. Composition and preparation

1.1. Polymers

Batch #036 corresponds to the Advanced kit consisting of 14 common polymers [LDPE, HDPE, PP, PVC, PET, PS, PC, SBR, ABS, PMMA, PA6, PA66, PU {thermoset} & TPU {thermoplastic}]. Each polymer type is provided in the form of microplastic (MP) fragments with a maximum diameter of approximately 50 µm, obtained by sieving through a 300-mesh grid (Fig. 1).

Fig. 1: Example: Photomicrograph captured under critical-angle darkfield illumination (CADLFI) of LDPE fragments sieved through a 300-mesh grid.

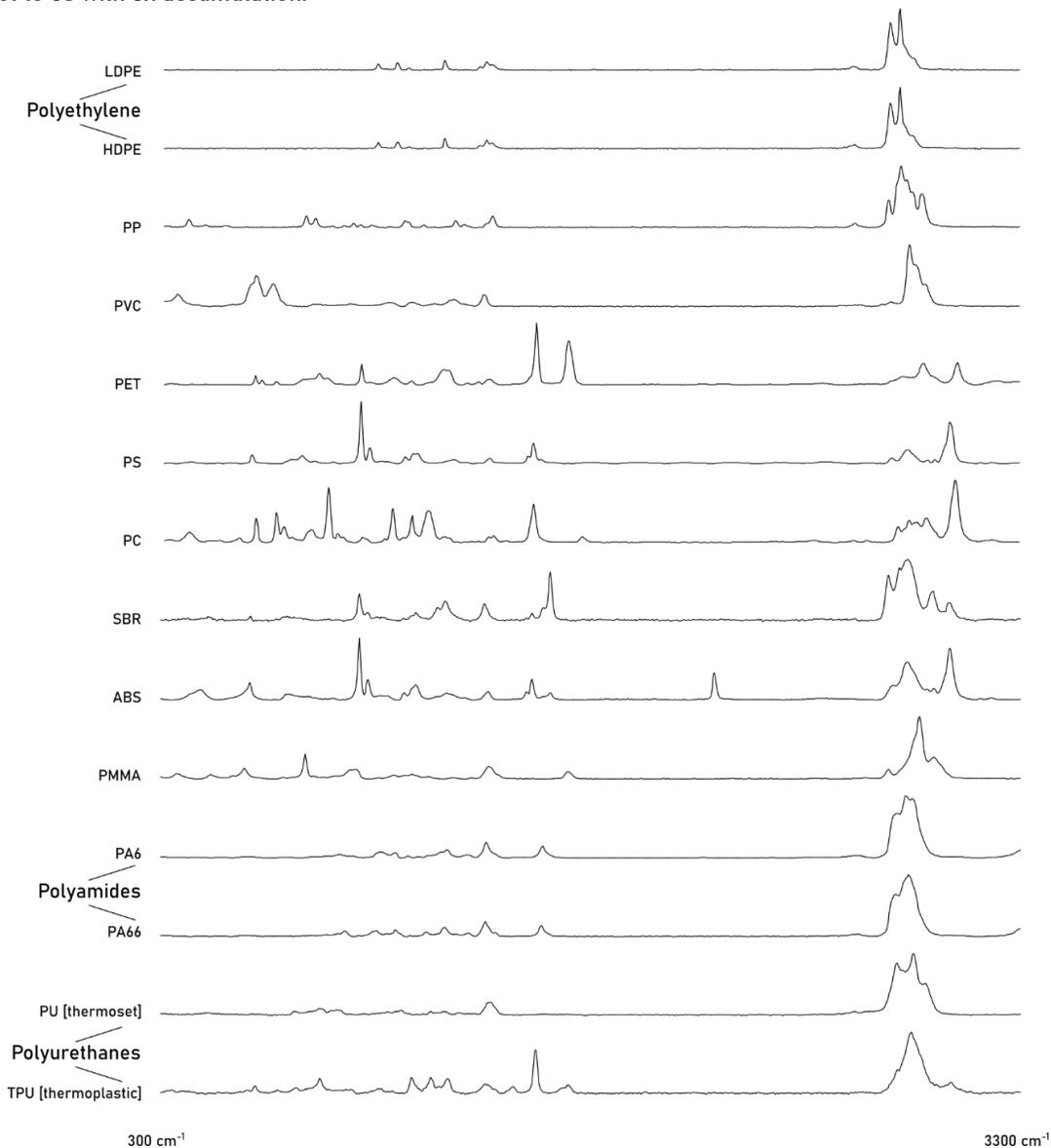


The MP fragments are weighed and dispersed in Calcium carbonate (CaCO₃) diluent, ensuring a traceable distribution of polymer mass within the matrix. Each MP fragment weighs less than 10 ng; therefore, 1 µg of MP powder typically consists of at least 100 particles (at the lowest available concentration of 1.0 µg/mg [0.1 % (w/w)]), ensuring reliable particles dispersion within



the CaCO₃ matrix. The nature and purity of each polymer were confirmed by Raman spectroscopy (Fig. 2).

Fig. 2: Raman spectra of the fourteen polymers used in Batch #036. Raman analysis was conducted at a controlled room temperature (22°C) using a Horiba (Jobin Yvon, France) LabRAM Soleil equipped with a high stability air-cooled He-Cd 532 nm laser diode and Nikon LV-NUd5 100x objective. The laser power was set to 6.3% (5.7 mW). Spectra were collected in the 300–3300 cm⁻¹ range using 600 grooves/cm grating with a 100 μm split. The spectra acquisition time was set to 3s with 3x accumulation.





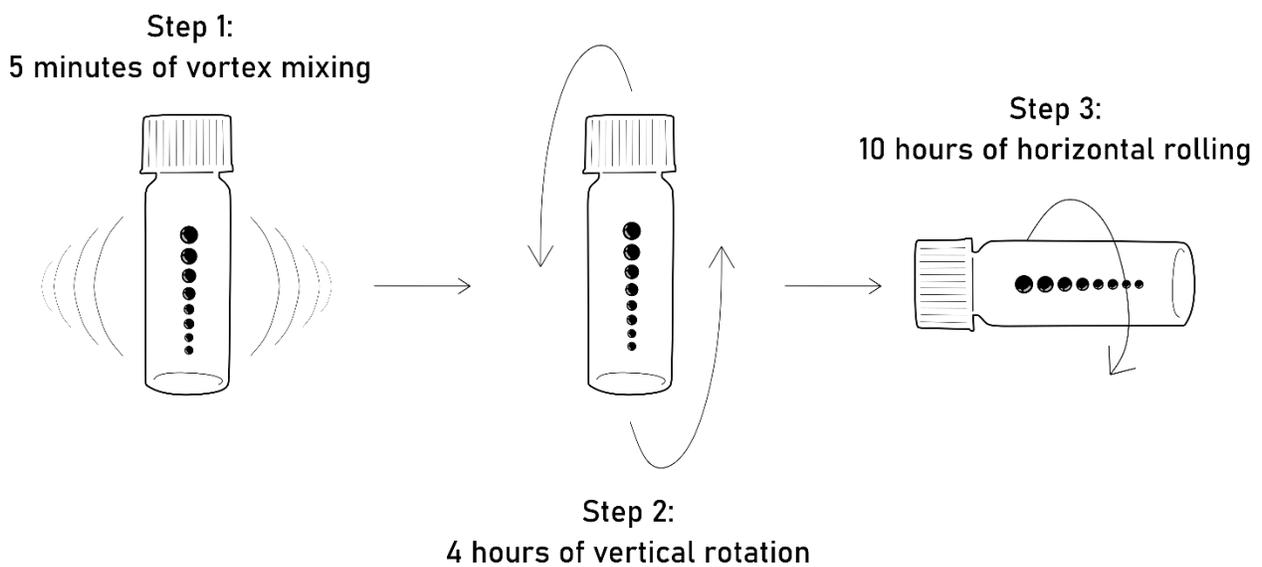
1.2. Diluent

CaCO₃ powder was calcined in a muffle kiln at 530°C prior to use to eliminate possible residual organic matter and ensure material purity.

1.3. Preparation of polymers-diluent blend

Fourteen polymers were dispersed in CaCO₃ diluent at the concentration of 5% (w/w). To ensure complete homogeneity, polymer-diluent blend was mixed for 28 hours using continuous agitation, consisting of an initial 5 minutes of vortex mixing, followed by 4 hours of vertical rotation and 24 hours of horizontal rolling (Fig. 3). To enhance dispersion and facilitate the breakdown of potential aggregates, eight 304 stainless-steel spheres of different diameters (2.0 mm, 2.5 mm, 3.0 mm, 3.5 mm, 4.0 mm, 4.5 mm, 5.0 mm, and 5.5 mm) were added to the mixture.

Fig. 3: Scheme of polymer-CaCO₃ blend homogenization process.





2. Sample contents

2.1. Stock mixture

Stock mixture (Batch #036) with a total mass of 5.0 g was prepared, containing approximately 50 µg/mg (5.0% w/w) of each polymer. The specific weighed amounts are provided in Table 1.

Table 1: Polymer concentrations in the stock mixture used for the current sample.

Polymer type	Mass of polymer, (mg)	Mass of CaCO ₃ diluent, (mg)	Total mass of stock mixture, (mg)	Polymer concentration, (µg/mg)	Polymer concentration, (%)
LDPE	250.1	1500.5	5023.1	49.8	5.0
HDPE	250.1			49.8	5.0
PP	250.7			49.9	5.0
PVC	250.2			49.8	5.0
PET	268.9			53.5	5.4
PS	250.3			49.8	5.0
PC	250			49.8	5.0
SBR	250.1			49.8	5.0
ABS	250.5			49.9	5.0
PMMA	250.2			49.8	5.0
PA6	250.3			49.8	5.0
PA66	250.4			49.8	5.0
PU	250.1			49.8	5.0
TPU	250.7			49.9	5.0
Mean	251.6			50.1	5.0



2.2. Batch #036-2

Following preparation of the stock mixture, Batch #036-2 was produced through a one-step dilution. Details of the dilution volumes and resulting concentrations are provided in Table 2.

Table 2: Polymer concentrations in the diluted mixture (Batch #036-2).

Dilution step / Resulting Batch	Stock Batch used	Mass of Stock Batch, (mg)	Mass of CaCO ₃ diluent, (mg)	Total mass, (mg)	Polymer type	Polymer concentration, (µg/mg)	Polymer concentration, (%)
1 - Batch #036-2	#036	200.1	800.8	1000.9	LDPE	10.0	1.0
					HDPE	10.0	1.0
					PP	10.0	1.0
					PVC	10.0	1.0
					PET	10.7	1.1
					PS	10.0	1.0
					PC	10.0	1.0
					SBR	10.0	1.0
					ABS	10.0	1.0
					PMMA	10.0	1.0
					PA6	10.0	1.0
					PA66	10.0	1.0
					PU	10.0	1.0
TPU	10.0	1.0					
Mean						10.0	1.0

After dilution, three 3 mm 316L stainless-steel spheres were introduced into the mixture, and the samples were homogenized following the same procedure applied to the stock solution (Fig. 3).



3. Contamination control

All sample processing steps were carried out under contamination-controlled conditions. Operators were equipped with 100% cotton lab coats and nitrile gloves. All sampling tools were made of glass, metal or fluoropolymers (PTFE, PFA) to prevent contact with commodity plastics. Utensils (vials, stainless-steel spheres, etc.) were rinsed with abundant tap water, Milli-Q and ethanol. All glass tools were calcined in a muffle kiln for 2 hours at 530 °C.

4. Disclaimer

The information given in this COP is correct to the best of our knowledge at the time of issue. Microplastic Solution (MPS) makes no warranties, express or implied, and assumes no liability in connection with the use of this product.

4.1. Support

We are dedicated to helping researchers succeed. If you experience any issues with this material or require additional information, please reach out to us at contact@microplasticsolution.com. We are committed to supporting researchers in their micro- and nanoplastic analyses.

Approved by:

Dr. Oskar Hagelskjær, CEO
Date: 07-Jan-2026
Place: Saint-Orens-de-Gameville, France

A handwritten signature in black ink, appearing to be 'OH'.

Dr. Nadiia Yakovenko, Microplastic researcher
Date: 07-Jan-2026
Place: Saint-Orens-de-Gameville, France

A handwritten signature in blue ink, appearing to be 'N. Yakovenko'.



Abbreviations

COP	Certificate of Preparation
Py-GC-MS	Pyrolysis-gas chromatography-mass spectrometry
MP	Microplastic
LDPE	Low-density polyethylene
HDPE	High-density polyethylene
PP	Polypropylene
PVC	Polyvinyl chloride
PET	Polyethylene terephthalate
PS	Polystyrene
PC	Polycarbonate
SBR	Styrene butadiene rubber
ABS	Acrylonitrile butadiene styrene
PMMA	Polymethyl methacrylate
PA6	Polyamide 6
PA66	Polyamide 66
PU	Polyurethane [thermoset]
TPU	Polyurethane [thermoplastic]

Units

mg	Milligram
µg	Microgram
ng	Nanogram
cm	Centimeter
µm	Micrometer
w/w	Weight by weight
°C	Degree Celsius (temperature)