BAM
Bundesanstalt für Materialforschung und -prüfung

REFERENCE MATERIAL DOCUMENT

REFERENCE MATERIAL BAM-P208

Polypropylene (microplastic powder)

Particle size distribution – property of interest

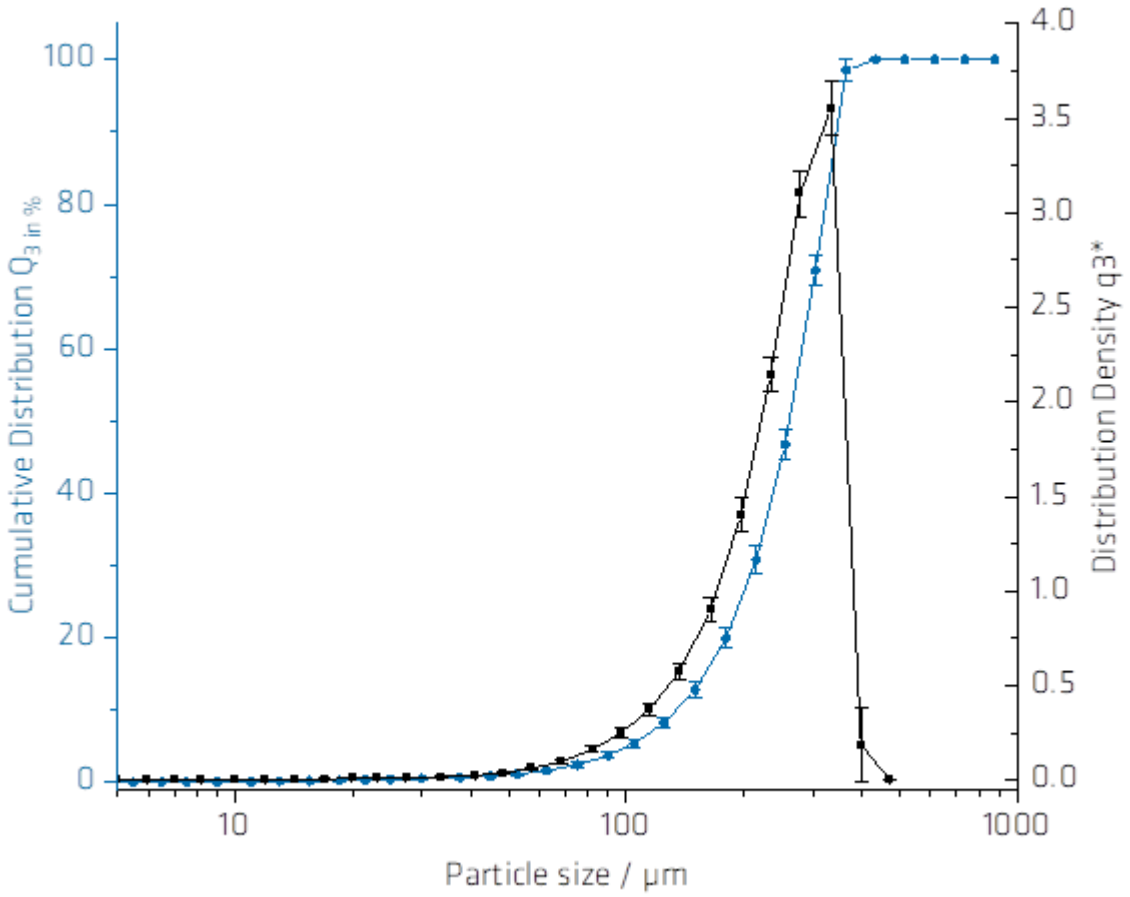
Particle size distribution	**Equivalent particle diameter**[2] in µm	**Expanded uncertainty**[3] U in µm
Dv10[1]	123	8
Dv50[1]	248	10
Dv90[1]	340	4

[1] Equivalent particle diameter Dv10/Dv50/Dv90 of the measured volume-based particle size distribution, below which 10.3% / 50.3% / 90.3% of the cumulative particle volume is contained. The reported percentile values (10.3%, 50.3%, and 90.3%) follow the instrument manufacturer's definition of Dv10, Dv50, and Dv90.

[2] Mean values determined by laser diffraction under dry dispersion with two different devices using 18 values. For further information see the characterization study for the property of interest (Report Section 3.2).

[3] Estimated expanded uncertainty $U = k \cdot u_c$ with a coverage factor $k = 2$, corresponding to a level of confidence of approximately 95%, calculated according to ISO 33405. The combined uncertainty u_c includes the standard uncertainty due to characterization, the contribution of variation between bottles and the long-term stability contribution.

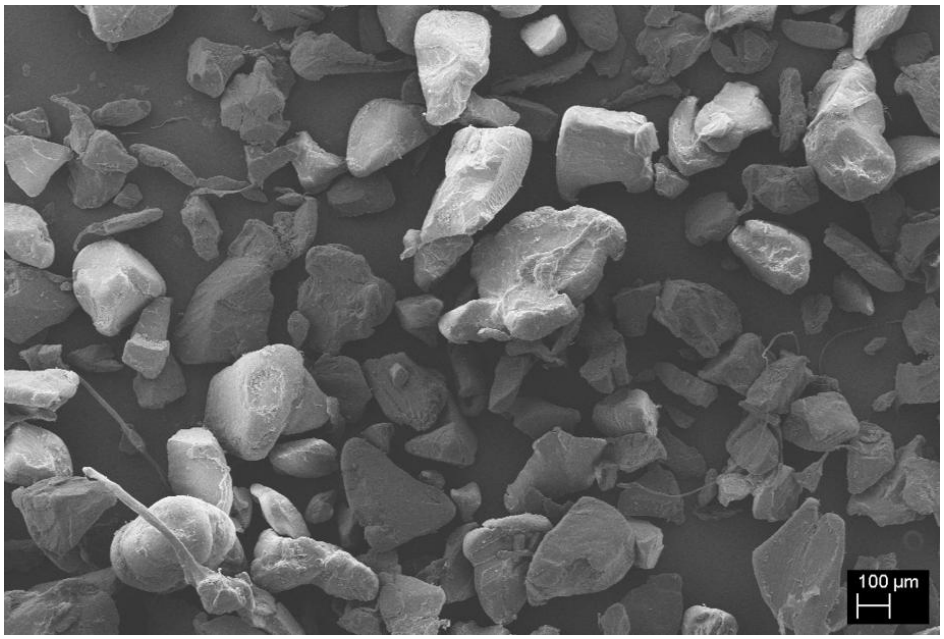
Date of dispatch: _____



Equivalent particle diameter with standard deviation from homogeneity study of BAM-P208. 10 individual bottles of BAM-P208 were randomly selected and measured three times each. The blue curve represents the cumulative distribution $Q_3(x)$ and shows the volume fraction of particles smaller than x in relation to the total volume. The black curve represents the distribution density $q_3(x)$ (1st derivate of Q_3) and displays the probability of finding a particle with an equivalent particle diameter x in the population. For further information please see the corresponding report for BAM-P208.

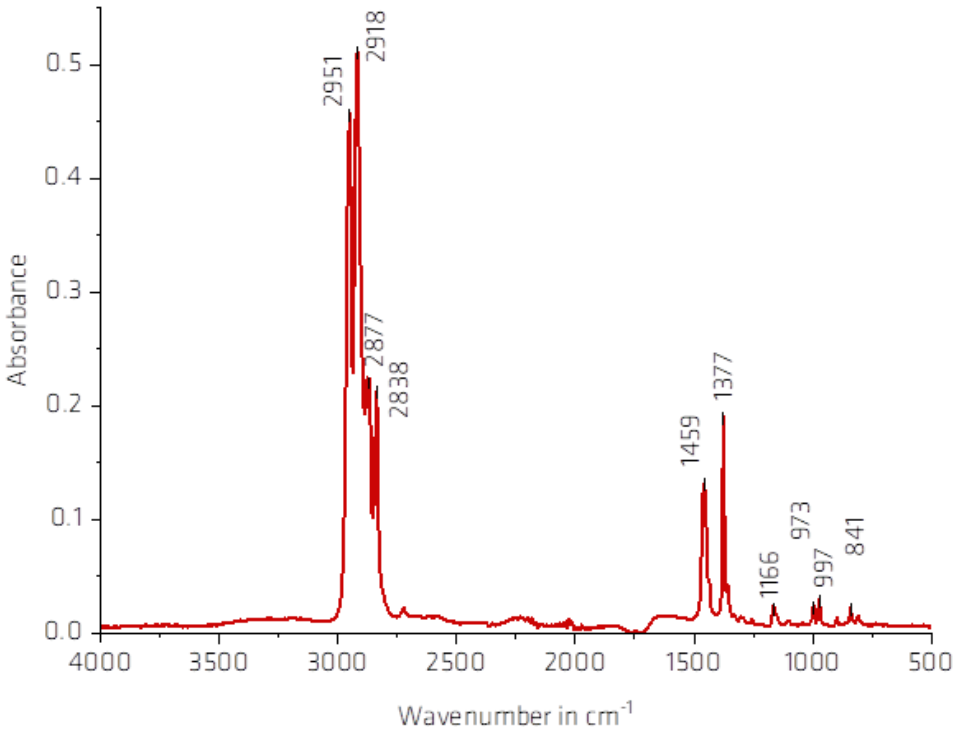
Additional Properties

Scanning electron microscopy (SEM)



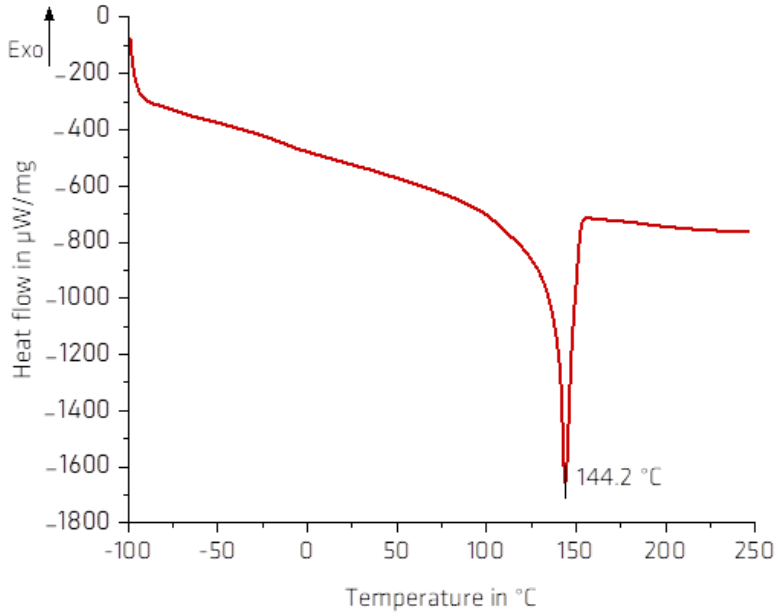
PP particles were analysed by SEM (Zeiss Supra 40, Oberkochen, Germany) with a Schottky field emitter and equipped with a high-resolution In-lens SE (secondary electrons) detector with an acceleration voltage of 10.0 kV and 5 mm working distance.

Attenuated total reflection – Fourier transform infrared spectroscopy (ATR-FTIR)



ATR-FTIR spectroscopy was performed on BAM-P208 powder with a Nicolet Nexus 6700 FTIR spectrometer equipped with SmartOrbit Diamond module and DTGS detector. The spectra were recorded from 4000 to 500 cm-1 averaging 32 scans with a resolution of 4 cm^{-1}. The obtained data were processed with ATR correction (Diamond crystal) and automated baseline correction with the OMNIC 9 software (Thermo Fischer Scientific, Karlsruhe, Germany). Characteristic peaks were identified by associated bands and additionally compared with the Hummel Polymer Sample Library from Thermo ScientificTM.

Differential scanning calorimetry (DSC)



DSC was carried out three times with a DSC 7020 (Seiko, THASS, Germany) from -150 to 200 °C at a constant heating rate of 10 K/min. A melting temperature T_m of 144.2 °C proves the PP material.

End of Validity

This document is valid for two years after dispatch, provided that the reference material is stored under the recommended conditions.

Material Description

Polypropylene (Moplen RP320M, random copolymer) was kindly provided by LyondellBasell Industries Holdings B.V. The granulate was milled in a centrifugal mill (ZM200, Retsch, Haan, Germany) under pre-cooling with liquid nitrogen and a velocity of 18000 rpm. The mill was equipped with a stainless-steel ring sieve (500 µm) and a cyclone. The prepared fragments were sieved in 50 g batches using a sieving machine consisting of a sieve tower with a collecting pan and a 50 and 500 µm sieve (stainless-steal, 20 cm diameter, Retsch). The material retained on the 50 µm sieve was transferred into a 0.5 L brown glass bottle, homogenized in a tumble mixer (30 min), and

subsequently aliquoted into 317 brown glass bottles with metal screw caps and silicone/polytetrafluoroethylene (PTFE) seals (1 g each).

Recommended Use

The present material is intended for the validation of sampling, sample preparation and detection of microplastics.

Transport, Storage and Handling

Reference Material BAM-P208 can be shipped at ambient temperature. It should be stored under dark and dry conditions at a temperature of (5 ± 3) °C in its original tightly closed bottle. BAM cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened bottles. In case of further transport, the packaging should be free of plastic to avoid contamination.

Literature

A detailed technical report describing the analysis procedures and the treatment of the analytical data used to characterize BAM-P208 is available on request or can be downloaded from BAM website (www.webshop.bam.de).

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