Für Mensch & Umwelt

BAM Bundesanstalt für Materialforschung und -prüfung

Umwelt Bundesamt

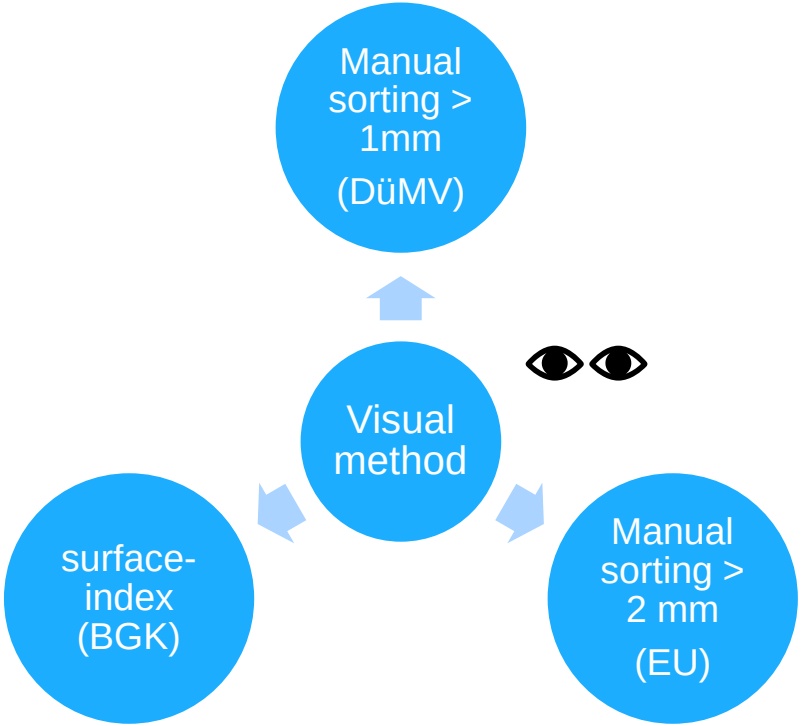
PidU – Plastik in Böden am 25.01.2022:

Ergebnisse aus den methodischen Untersuchungen zu Kunststoffgehalten in Komposten und Gärrückständen

Marius Bednarz (UBA)

Yosri Wiesner (BAM)

Plastic Contents in solid samples
Investigation Methods



Quality depends on the operator

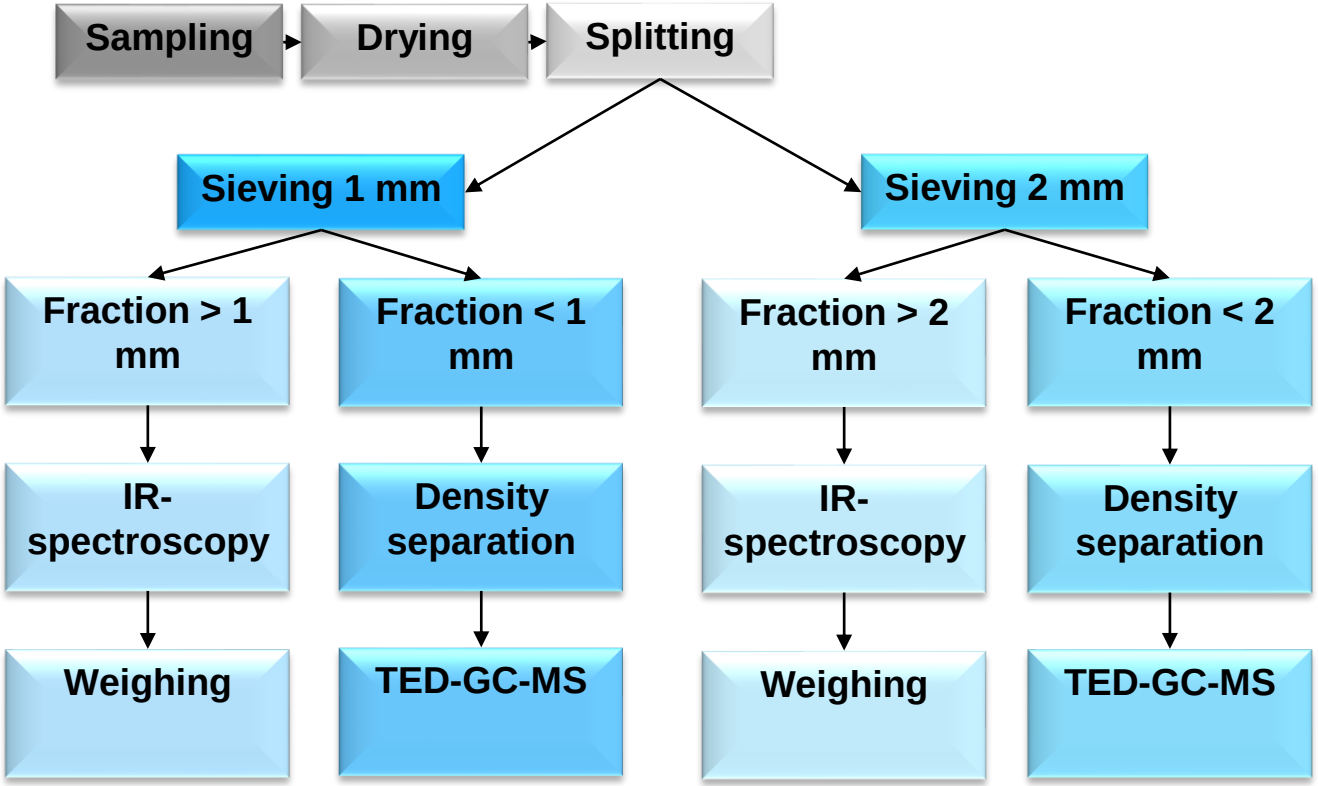
Dark/ black plastics are invisible

No information for:

- Plastic contents < 1/ 2 mm
- Type of plastics

70 % mis determination (Hidalgo, 2012)

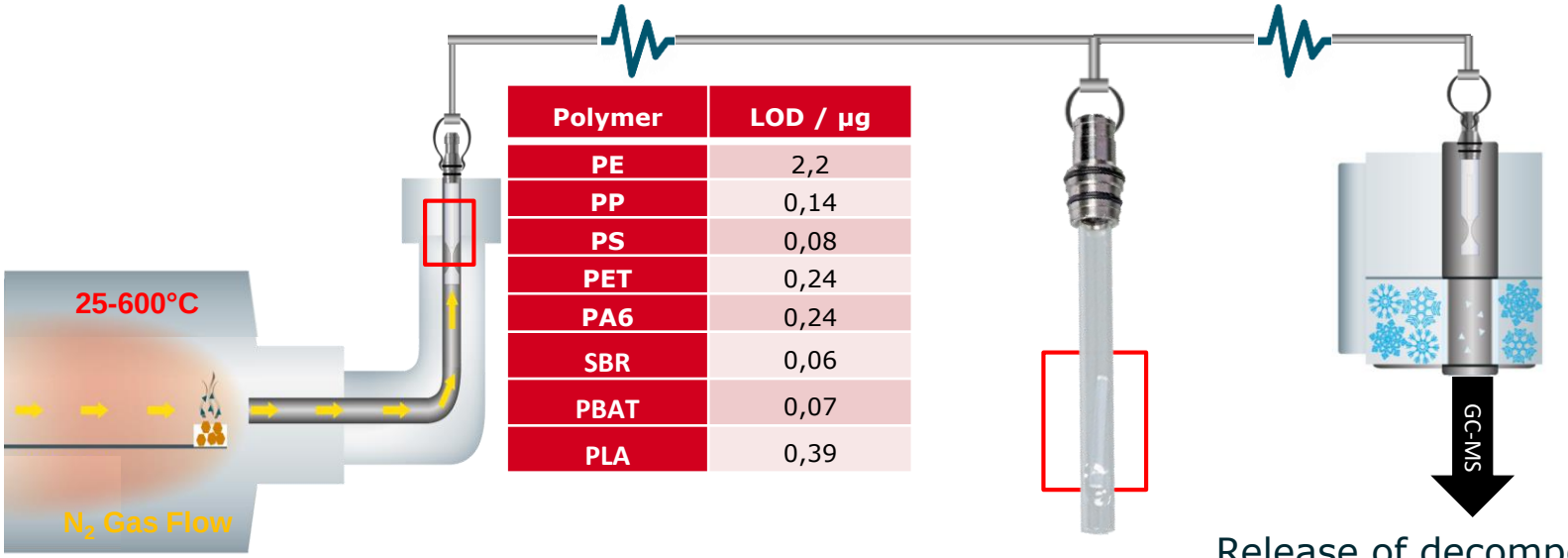
Plastic Contents in Solid Samples
Investigation Scheme




Own source


Own source

Analytic
Introduction – TED-GC-MS



Polymer	LOD / µg
PE	2,2
PP	0,14
PS	0,08
PET	0,24
PA6	0,24
SBR	0,06
PBAT	0,07
PLA	0,39

Release of decomposition gases and measurement by GC-MS

Investigated Objects
Biowaste Treatment Plant (Object 1)

Biowaste delivery → Pre-treatment → Fermen-tation → Rotting → Compost

~100 L compost
↓
homogenization
↓
10x 1L investigation samples
↓
sieving 1 mm → fractions </>1 mm → FTIR
sieving 2 mm → fractions </>2 mm → TED-GC-MS

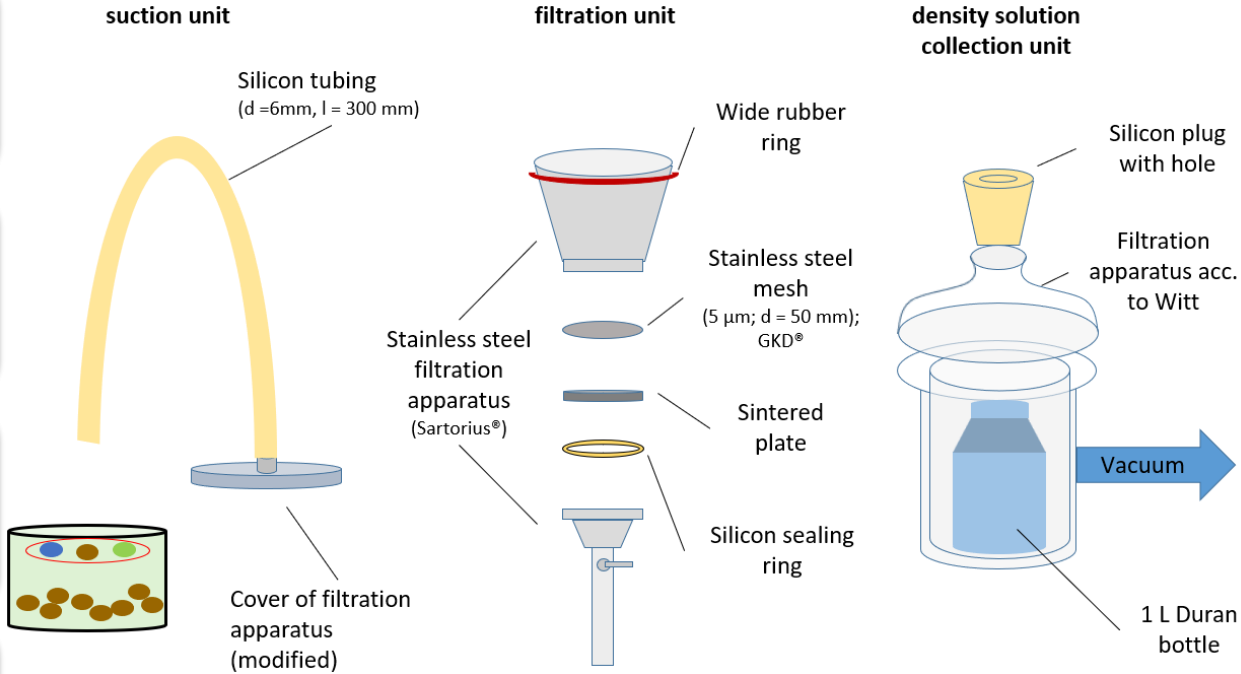
Investigated Objects
Plant for Food Returns (Object 3)

Food return → “unpacking” → Fermen-tation → Post-treatment

2x 4,5 L fermentation residues
↓
sterilization
↓
homogenization
↓
sieving 1 mm → fractions </>1 mm
sieving 2 mm → fractions </>1 mm
↓
TED-GC-MS

Plastic Analysis (<1 mm)
Sample Pretreatment – Compost

- Repre-sentativ aliquot
- Density separation
- Clean up
- Drying



Sample mass (< 1mm): 50 – 150 g
Separation solution: sodium iodide (1,895 g/cm^3)

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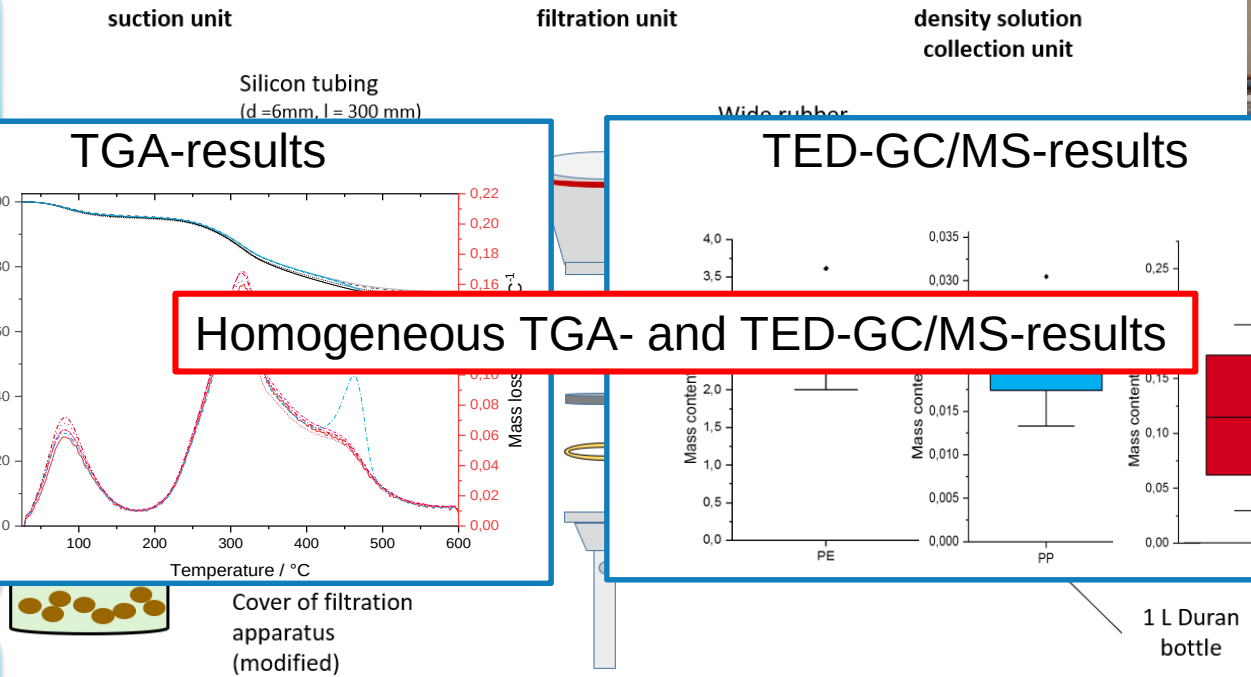
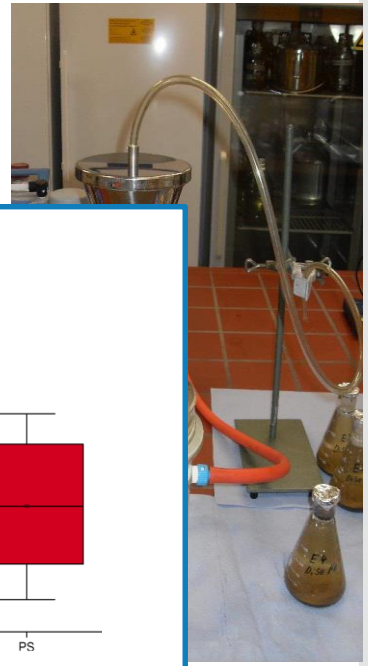


Homogeneous TGA- and TED-GC/MS-results



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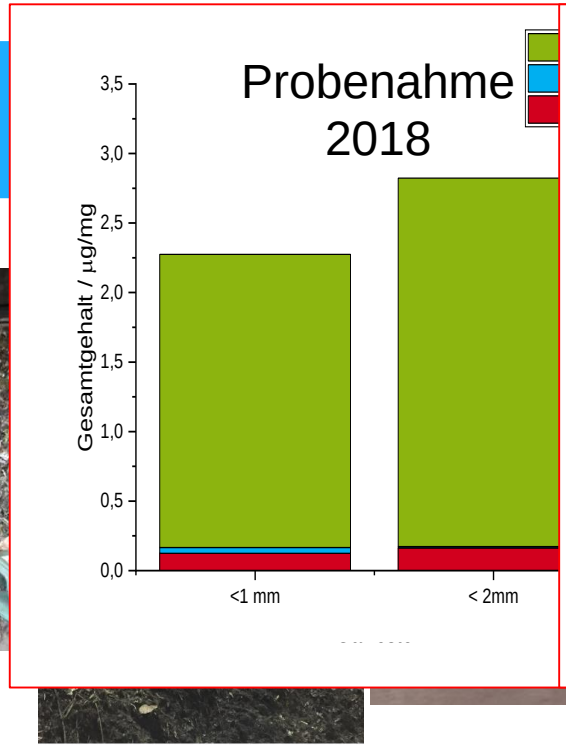
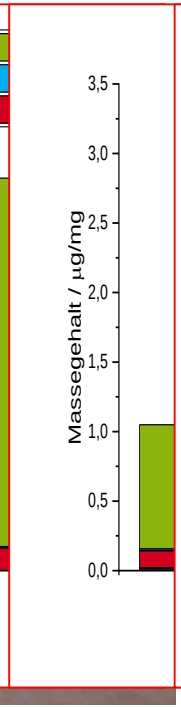
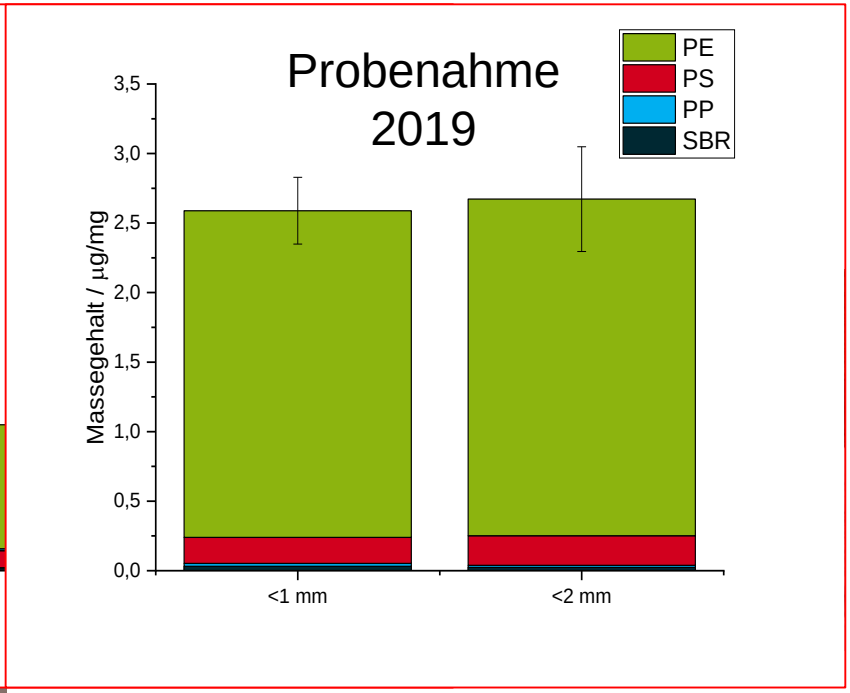
Results
Biowaste Treatment Plant (Object 1)

Biowaste delivery

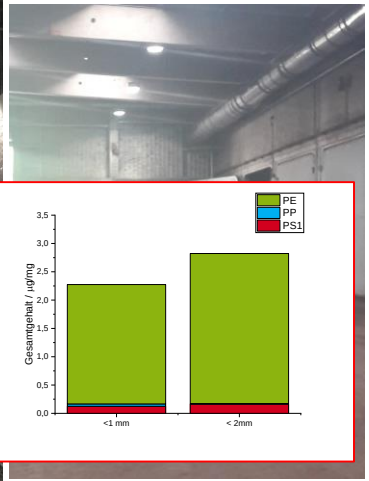


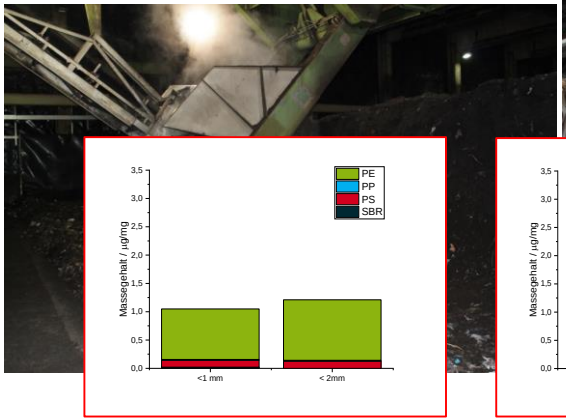


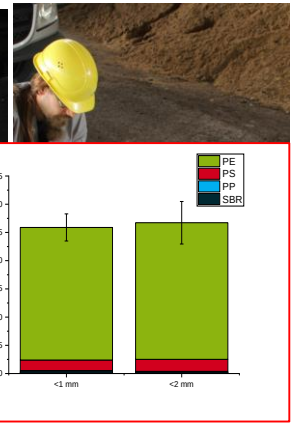


Results
Biowaste Treatment Plant (Object 1)

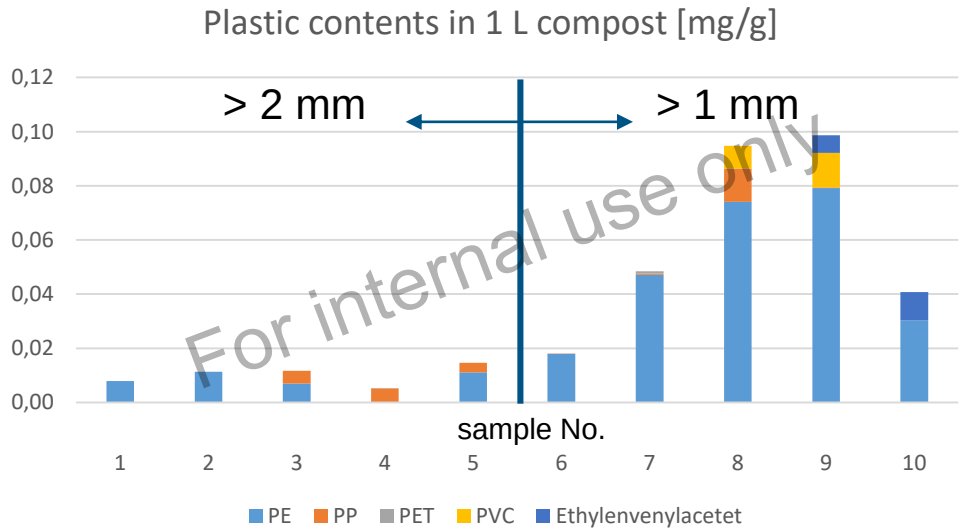
Biowaste delivery → Pre-treatment → Fermentation → Rotting → Compost

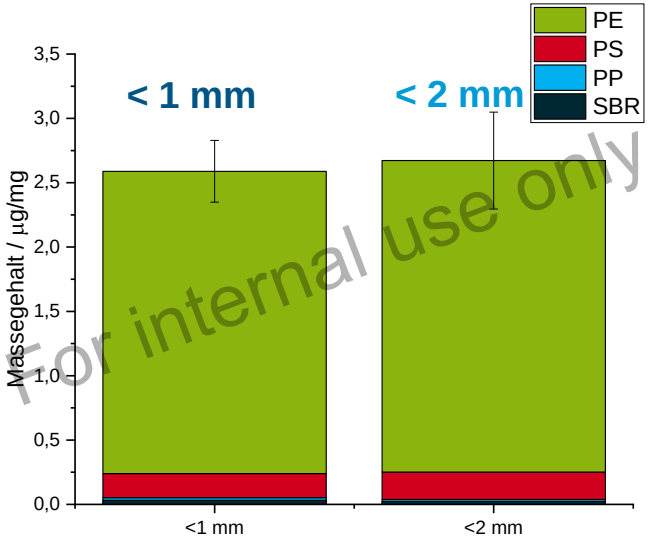






Results – Plastics in Compost
August 2019





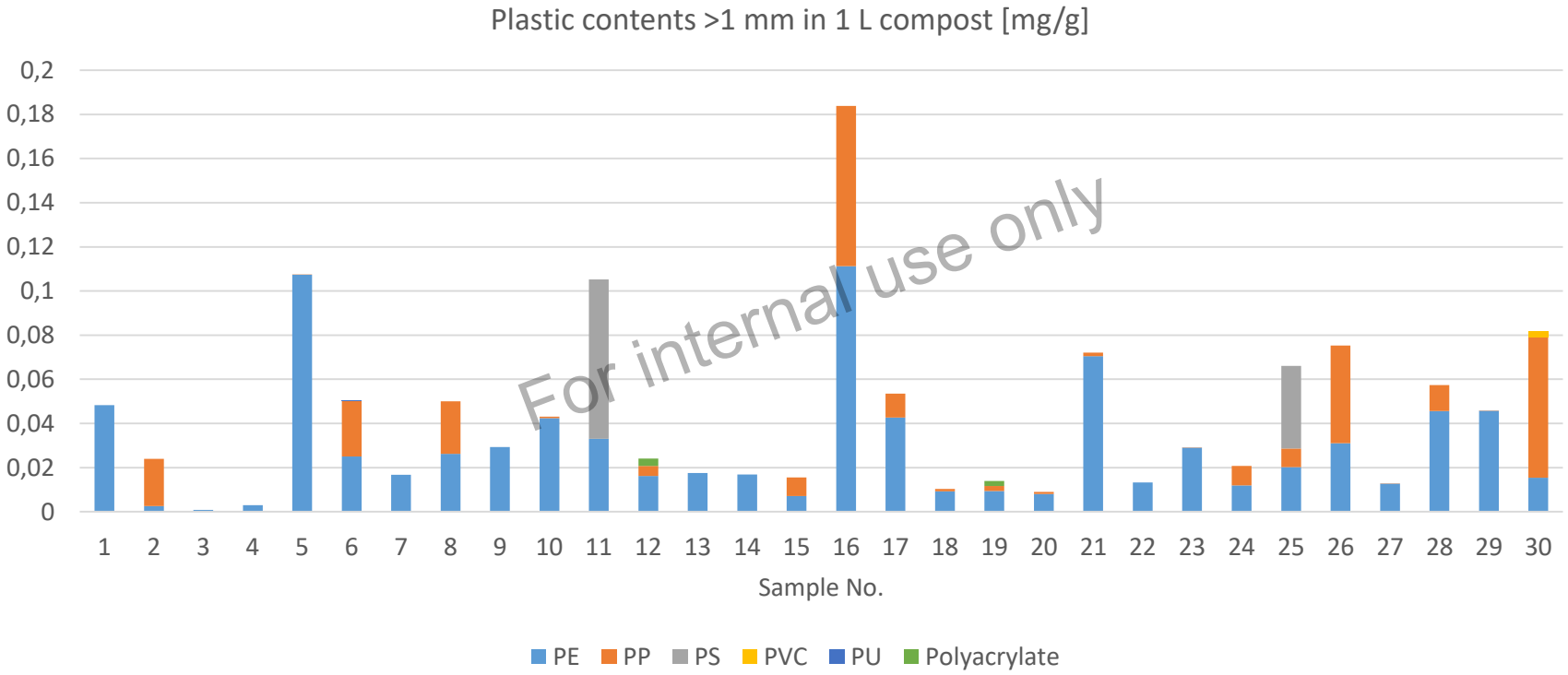
contents > 2 mm:
0,006 - 0,014 mg/g

contents > 1 mm :
0,017 - 0,097 mg/g

Contents fine fraction:
~ 2,5 mg/g

Plastic contents in the fine fraction significantly higher than in coarse fraction
No difference in content in the fine fractions (<1/<2 mm)

Results – Plastics in Compost
November 2019



Plastic contents in 1 L compost very inhomogeneous
Increase of the sample volume is recommended

Results

Plant for Food Returns (Object 2)

Food return

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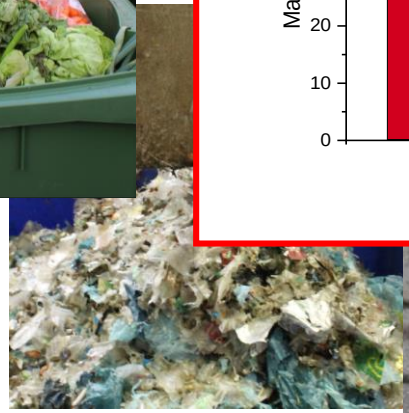
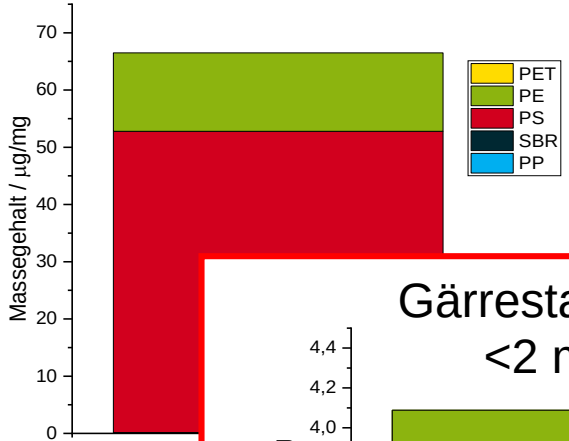
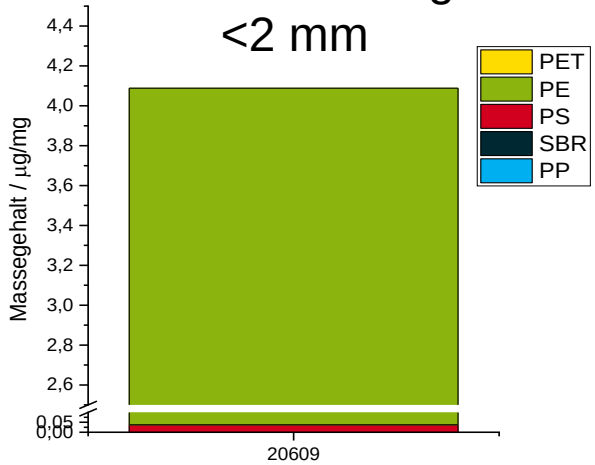


Gärausgangsmaterial



separator

Gärrestaustrag
<2 mm



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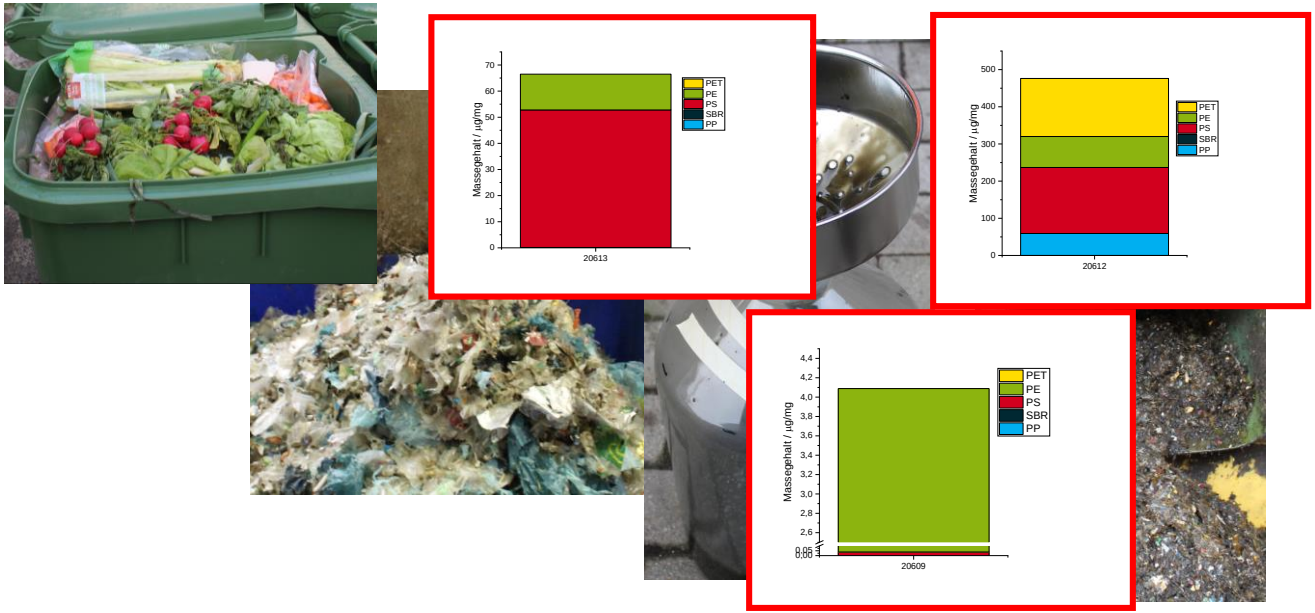
fractions
</>1 mm

GC-MS

Results
Plant for Food Returns (Object 3)

Food return → “unpacking” → Fermen-tation → Post-treatment



2x 4,5 L fermentation residues
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sterilization
↓
homogenization
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sieving 1 mm → fractions </>1 mm
sieving 2 mm → fractions </>1 mm
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TED-GC-MS

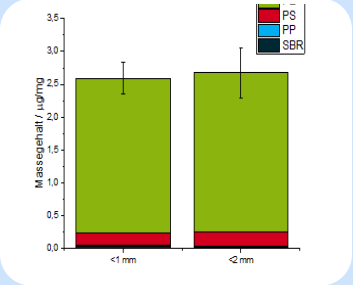
Conclusion

Represen-tativeness of 1 L compost samples sufficient?

Increase of the test volume recommended

TED-GC-MS method useful for plastic content determination < 1mm

Sample preparation established for microplastics analysis in compost



Hardly any differences for plastic contents <1 and <2 mm

Significantly higher plastic content in the fine fraction of the compost

Vielen Dank für Ihre Aufmerksamkeit!

Kontakt:
Yosri.Wiesner@bam.de
Marius.Bednarz@uba.de

Dank an das BMBF für