

Analysis of Microplastics in Clean Water: Minimum Requirements and Best Practice Guidelines

*Barbara E. Oßmann, Darena Schymanski, Nizar Benismail, Kada Boukerma, Gerald Dallmann,
Elisabeth von der Esch, Dieter Fischer, Franziska Fischer, Douglas Gilliland, Karl Glas, Thomas
Hofmann, Andrea Käßler, Sílvia Lacorte, Julie Marco, Maria EL Rakwe, Jana Weisser, Cordula Witzig,
Nicole Zumbülte, Natalia P. Ivleva*

Abstract/Intention

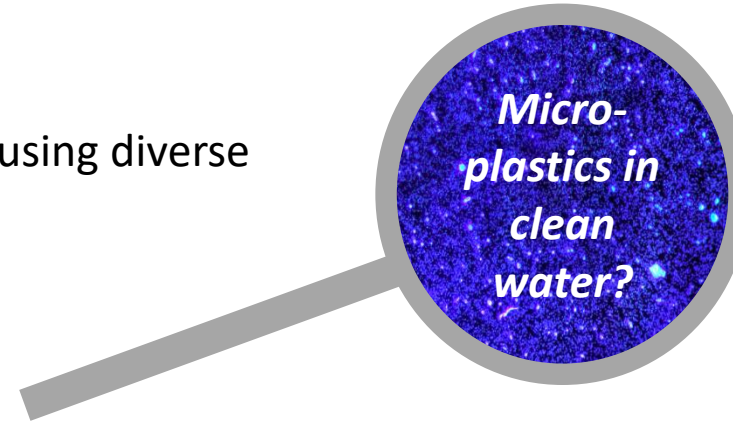
Lots of studies on microplastics in water are published using diverse analytical techniques.

→ The results are not comparable or even invalid.

→ There is a huge need for harmonization.

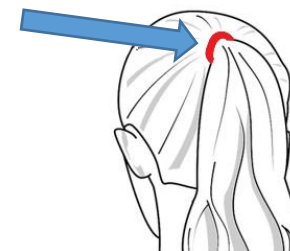
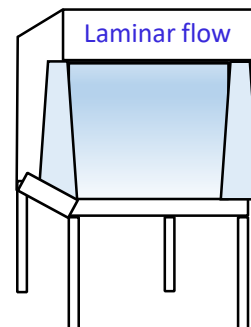
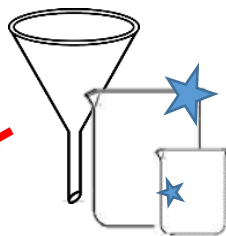
We established a working group of 12 laboratories experienced in microplastic analysis.

Minimum requirements and **best practices** were discussed and specified as consensus for microplastic analysis in clean water (low matrix content).

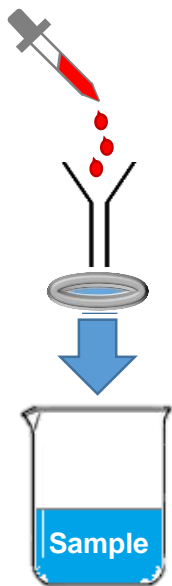


How to avoid
and control
sample
contamination?

General Precautions



Specific Precautions

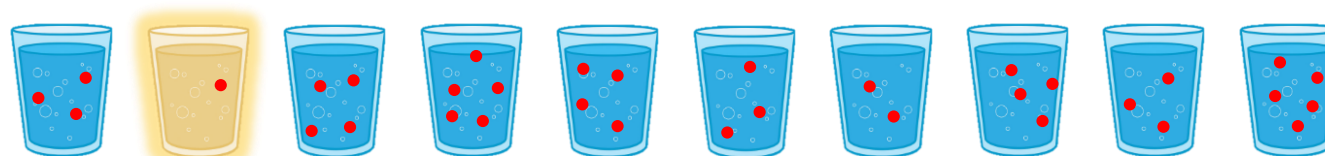


Check used chemicals
for contamination



Rinse sampling
container
before entering
clean area

Monitoring of Possible Contamination



→ Do a blank control at least every 10th sample

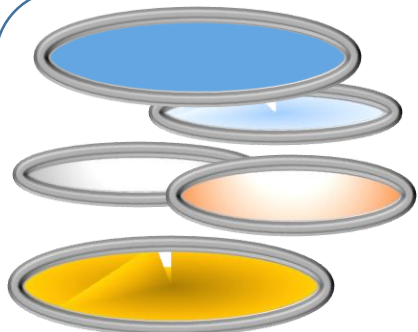
Sampling



1x ✓
3x ✓✓

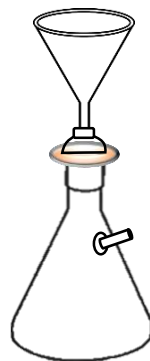
One bottle or 100s to 1000s of liters

How to do
representative
sampling?



Selection of ideal filter

- ✓ Flatness
- ✓ Dimensions (pore size, diameter)
- ✓ Detectability of particles
- ✓ Non-interfering

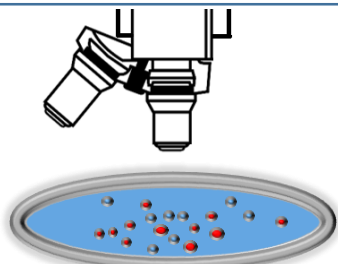


Filtration

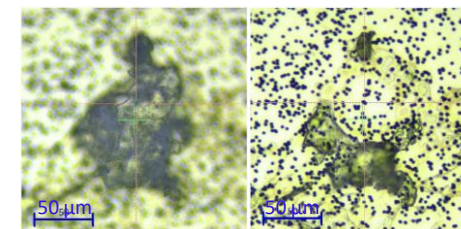
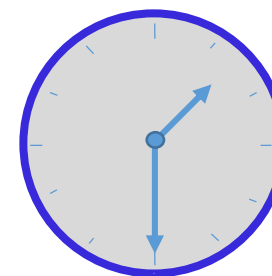
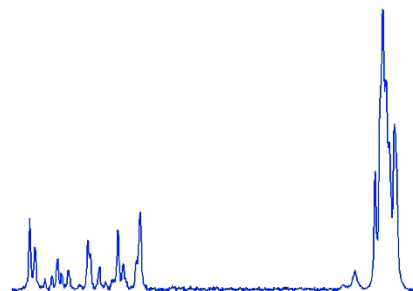
- Sample aliquotation
- Rinsing conditions
- Nature of filtration device, filter holder
- Storage

How to perform sample preparation and filtration?

How to analyze the particles with spectroscopic methods?

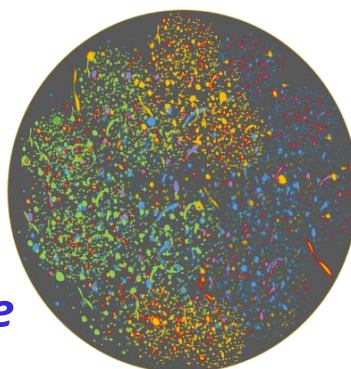


Infrared / Raman spectroscopy

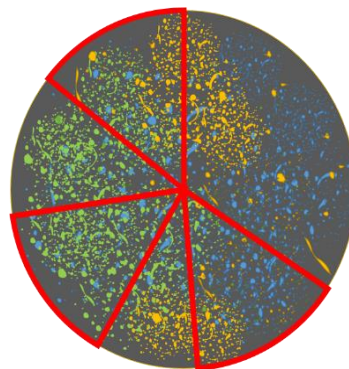


Good quality spectra ↔ Measurement time ↔ Non-destructive

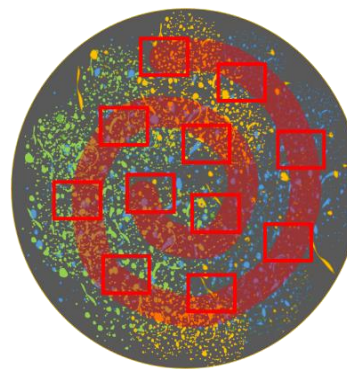
Analyze all particles or choose a model for **Representative analysis**



Random

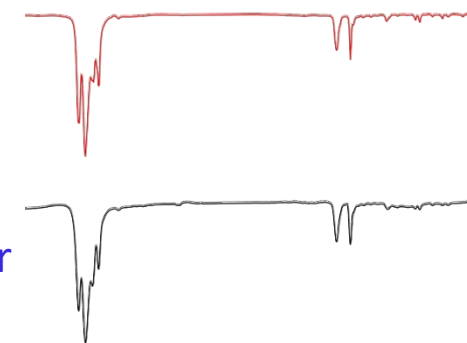


Cake



Snail

Match acceptance criterion,
e.g. HQI>70%
Check critical for reliability



How to
validate the
method?

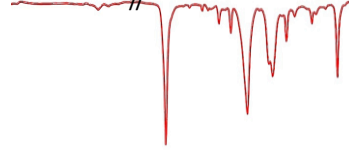
Quality assurance – Validation



Control
entire
process



Size
calibration



Polymer
identification

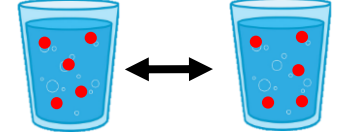


$\text{LOD} = \overline{\text{blank}} \pm 3 \cdot \text{SD}$
Daily blank < LOD

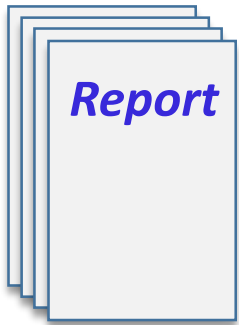


92%

Recovery
rates



Interlaboratory
comparison



Report

1.

Number of total
MPs identified

By type of
polymer

By size
range

2.

Total
number of
particles

% of all analyzed particles

3.

Number of
particles
analyzed

4.

LOD,
preferably
size-
dependent

5.

Additional
information
(size,
shape,
etc.)

How to
prepare a
sound report?

Pictures (partly modified) from

Schymanski D. & Oßmann B. E. et al., „Analysis of microplastics in drinking water and other clean water samples with micro-Raman and micro-infrared spectroscopy: Minimum requirements and best practice guidelines”, submitted.

Schymanski D. et al., „Analysis of microplastics in water by micro-Raman spectroscopy: Release of plastic particles from different packaging into mineral water.”, Wat. Res. 2018, 129: 154-162.

Oßmann B. E., „Microplastics in drinking water? Present state of knowledge and open questions” Curr. Opin. Food Sci. 2021, 41: 44-51.

Contact: barbara.ossmann@lgl.bayern.de; darena.schymanski@cvua-mel.de; natalia.ivleva@tum.de