

# Microplastics Standards - Status and Future Needs

---

The Science of Microplastics in the World Ocean - WHOI

Brett Howard

10.16.2019



# Standards - What Are They?

## A standard is:

- a recognized unit of comparison by which the correctness of others can be determined.
- a set of characteristics or qualities that describes features of a product, process, or service.

# Why Are Standards Important



**Fire sprinkler systems – NFPA 13**

**Internet communications – HTTP/3**

**Lights – UL 8750 (LEDs)**

**Electricity – NEC**

**Baseball – Official Baseball Rules**

# XKCD on Standards

HOW STANDARDS PROLIFERATE:  
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)



# Background

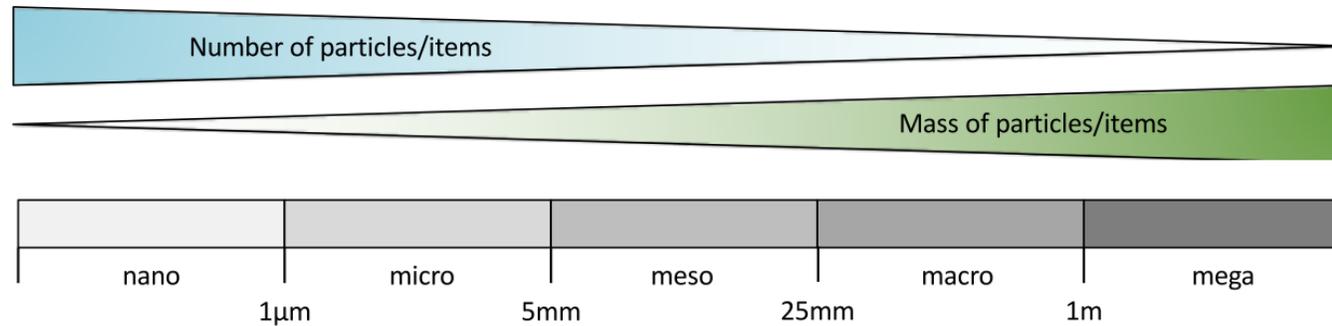
**“The lack of standard methods for sampling and analyzing microplastics in the environment means that comparisons across studies are difficult”**

***-WHO Report on MPs in Drinking Water***

**“Professional standards, certifications, and product labelling can motivate action”**

***-A Scientific Perspective on MPs in Nature and Society - SAPEA***

# Reporting Microplastics



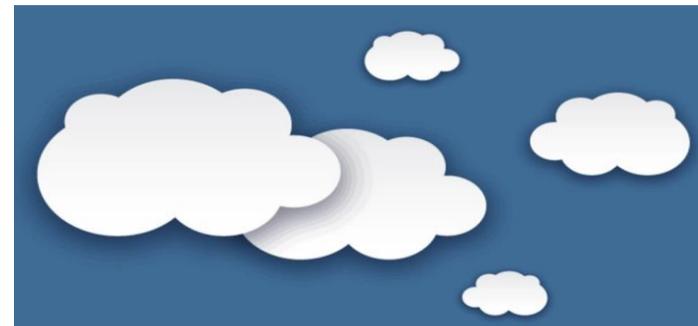
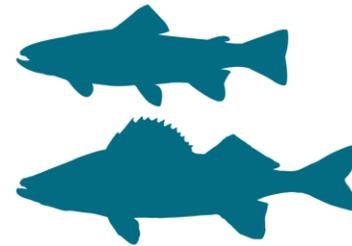
- The average microplastics content was  $118 \pm 88$  particles/L
- The large MP surface concentrations were between 10,000 and 250,000 pieces/km<sup>2</sup>. Small microplastic concentrations ranged from 500,000 to 7,000,000 pieces/km<sup>2</sup>...These concentrations are similar to the existing data (13–501 plastic debris per m<sup>3</sup>)

# Sampling Microplastics

- **Marine Environments**
- **Biological samples**
- **Atmospheric samples**



Studies have found particles in  
**12%**  
of freshwater fish<sup>1</sup>



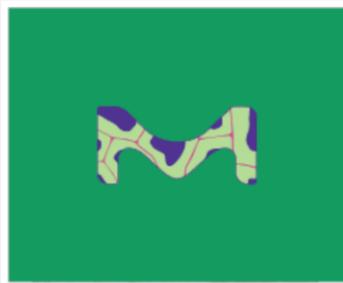
# Reference Standard

## Micro particles based on polystyrene

size: 10  $\mu\text{m}$

Synonym: **Latex beads from PS**

MDL number [MFCD00243243](#)



[SDS](#)

[Similar Products](#)

SKU-Pack Size	Availability	Pack Size	Price (USD)	Quantity		
72986-5ML-F	Available to ship on 10/16/19 - <a href="#">FROM</a>	5 ML	279.00	<input type="text" value="0"/>		
72986-10ML-F	Only 3 left in stock (more on the way) - <a href="#">FROM</a>	10 ML	426.00	<input type="text" value="0"/>		

[Bulk orders?](#)

[ADD TO CART](#)

### Product Recommendations

79633  
**Micro particles based on polystyrene**  
size: 5  $\mu\text{m}$

74491  
**Micro particles based on polystyrene**  
analytical standard, size: 20  $\mu\text{m}$

89904  
**Micro particles based on polystyrene**  
size: 1  $\mu\text{m}$

84135  
**Micro particles based on polystyrene**  
analytical standard, size: 30  $\mu\text{m}$

74964  
**Micro particles based on polystyrene**  
analytical standard, size: 15  $\mu\text{m}$



# Voluntary Consensus Standard

At the heart of the U.S. standards system are voluntary standards that arise from a **formal, coordinated, consensus-based and open process. Developed by subject matter experts from both the public and private sectors**, the voluntary process is open to all affected parties and relies upon cooperation and compromise among a diverse range of stakeholders.

# Standards Bodies

**ASTM International**

**American National Standards Institute**

**NSF International**

**International Organization for Standardization**

# ASTM Activities

Active Committees	
Name	Title
ASTM D19.06	Methods for Analysis for Organic Substances in Water
ASTM D20.96	Environmentally Degradable Plastics and Biobased Products
ASTM D13.40	Sustainability of Textiles

# ISO Activities

## Active Committees

Name	Title	Comments
ISO/TC 61/SC 14	biodegradability, biobased plastics, carbon and environmental footprint, microplastics and ocean/terrestrial environments, recycling, waste management, and circular economy	ASTM D20.61 Represents US

**Additional MP TCs in soil, air, textiles, sewage treatment**



**ASTM**



# ASTM Standards - D19.06

**WW  
Sampling**

**Fibers**

Standards in Development			
Name	Title		Status
ASTM WK67565	Standard Test Method for the <b>Spectroscopic Identification</b> and Quantification of Microplastic Particles in Water Using Raman and IR Spectroscopy		Draft
ASTM WK67563	<b>Collection of Wastewater Samples</b> for the Identification and Quantification of Microplastic Particle		Draft
ASTM WK67564	<b>Preparation of Wastewater Samples</b> Allowing the Identification and Quantification of Microplastic Particles using Raman and FTIR Microscopy		Draft
ASTM WK67788	<b>Identification</b> of Microplastic Particles and fibers in Municipal Wastewater <b>using Pyrolysis-GC/MS</b>		Draft
ASTM WK62604	New Test Method for Qualitative and Quantitative Fiber Release of Fabrics - Dry Method		Proposed
ASTM D7841 - 13	Standard Practice for Sustainable Laundry Best Management Practices		Active

# ASTM Standards

**D833 – 19b – Standard terminology relating to plastics**

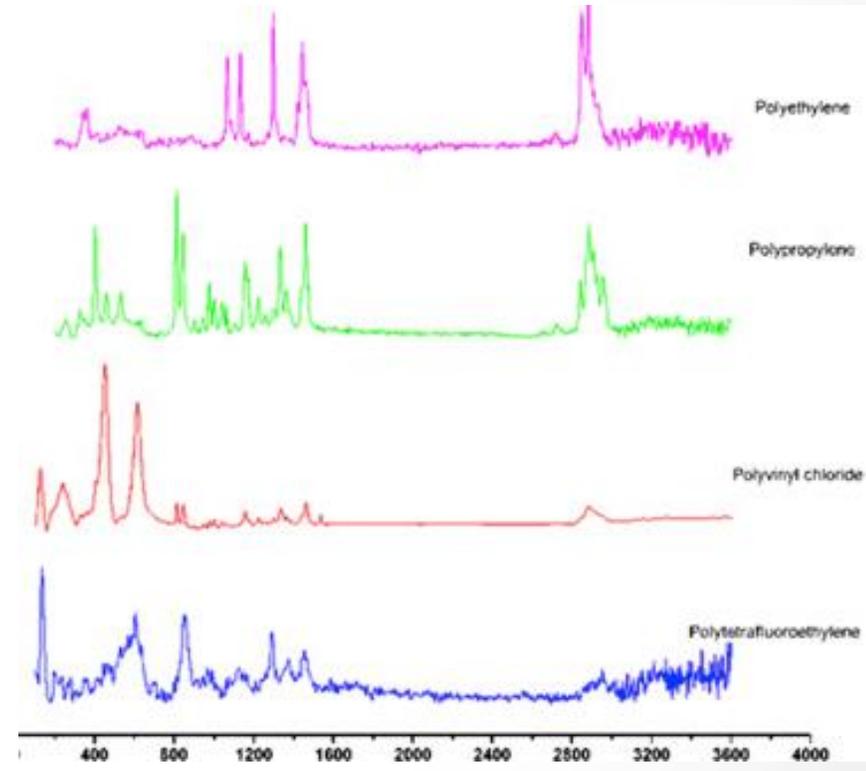
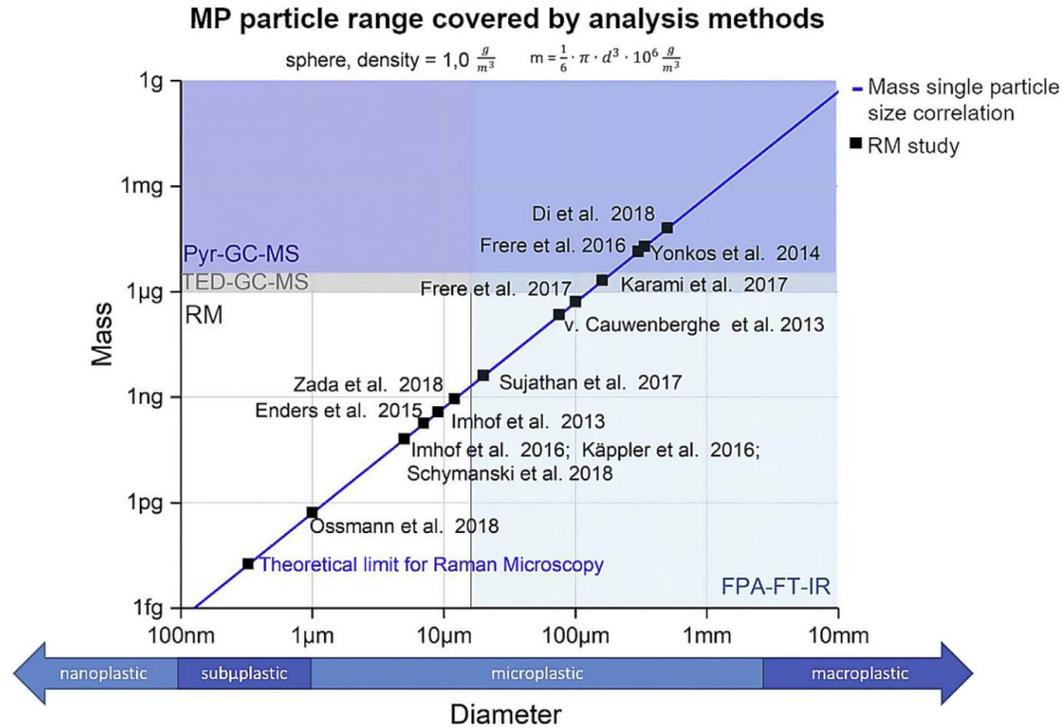
**Plastic(s), *n* – a material that contains as an essential ingredient one or more organic polymer substances of large molecular weight, is solid in its finished state, and, at some stage in its manufacture or processing into finished articles, can be shaped by flow.**



# ASTM WK67565

- **Identification and quantitation of microplastic particles in municipal raw wastewater influent and treated effluent**
- **Designed to distinguish plastic materials in municipal wastewater ranging in size from 20 $\mu$ m—5mm and index particle types via spectroscopic analysis. Confirms microplastic particle size, shape and surface features with appropriate instruments such as a scanning electron microscope**
- **Applies to all microplastic particles that exhibit absorption and reflection of light applicable for Raman and FTIR spectroscopy.**

# ASTM WK67565



# ASTM WK67564 - Sample Prep

Division into subsamples*1 (1,2,3,4,5)			
100 mL of SDS 10% (1,2,3,4,5)	1 d		
20 mL of protease (1,2,3,4) + 100 mL Tris HCl 1 M buffer	1 d	40 rpm	50 °C
5 mL of lipase (4) + 100 mL Tris HCl 1 M buffer	1 d		40 °C
25 mL of cellulase (1,2,3,5) + 100 mL NaOAc 1 M buffer	3 x 1 d		50 °C
20 mL of amylase (5) + 100 mL NaOAc 1 M buffer	1 d		50 °C
30 mL of H <sub>2</sub> O <sub>2</sub> I*2 (1,2,3,4,5)	1 d		
5 mL of chitinase (1,2,3,4) + 100 mL NaOAc 1 M buffer	3 d		37 °C
30 mL of H <sub>2</sub> O <sub>2</sub> II*2 (1,2,3,4,5)	1 d		
Density separation with ZnCl <sub>2</sub> (1,2,3,4,5)	1 - 3 d		
Filtration through an aluminium oxide filter			
Analysis via μFTIR			



# ASTM - Other Activities

- **WK 67563 – Wastewater Sample Collection**

Provides for the collection of municipal sewage and treated wastewater effluent for determining the presence of microplastic particles. Wastewater **samples are sieved through sieves of increasingly smaller mesh size** to allow for the collection of desired particle size fractions.

- **WK 67788 – Pyrolysis-GC/MS**

This test method is designed to distinguish plastic particles and fibers in municipal wastewater ranging in size from 1 $\mu$ m to 5mm and index particle and fiber types via pyrolysis-GC/MS. Prior to the pyro-gc/ms analysis, it is also desired to confirm microplastic particle size, shape and surface features with appropriate instruments such as a scanning electron microscope (SEM)

# ASTM D7841-13

- **Standard Practice for Sustainable Laundry Best Management Practices**  
The purpose of this practice is to identify and define sustainable laundry Best Management Practices (BMPs) that are used in commercial laundry facilities to reduce their impact on the environment.

# ISO Standards

<b>Standards in Development</b>		
Name	Title	Status
ISO/DTR 21960	Plastics in the Environment -- Current state of knowledge and methodologies	In committee
ISO/DIS 22766	Plastics -- Determination of the degree of disintegration of plastic materials in marine habitats under real field conditions	Enquiry



# Questions

