Composer:

Dimitri Voudouris

Composed:

2019 – 2022

Composition:

μΠυ

(64 - 85 YGN)

Duration: 10 min 30 sec

(0P88-300 LT)

Duration: 12 min 15 sec

(310 - 09 STT)

Duration: 12 min

Data / Audio detection techniques
of microplastics in fresh water source

ANALYSIS OF MICROPLASTICS

Characterized chemically by five dimensions:

- Broad size range, i.e., 1 µm to 1 mm and up to 5 mm.
- Different polymer types with various chemical compositions (including conventional and biopolymers of different structures and densities).
- Different shapes (spheres, irregular particles, fibres, films, foams).
- Various additives (antioxidants, light stabilizers, plasticizers, flame retardants, pigments, etc.), weathering products and sorbed contaminants (persistent organic pollutants, antibiotics, heavy metals etc.).
- Different ageing states (primary and secondary, biofouling), surface charge and hydrophobicity.

Therefore, taking into account the diversity of MPs and also the broad concentration range, expressed in terms of MP mass and particle numbers in real samples (which can vary by 10 orders of magnitude, e.g. 10−2−108 MPs/m3 for freshwater and drinking water samples), we are facing the following challenges for the analysis of microplastics:

- Depending on the pollution level of different media (water, soil, air, etc.) with MPs and the desired information (MP mass- or number of particles and size range), which defines the choice of detection method, the sample size (volume or mass) can vary significantly and has to be representative. Because substantially more particles are expected in smaller size ranges, small sample sizes can be sufficient for the determination of particle numbers down to the lower µ-range.
- Sensitive methods are necessary for chemical identification and quantification, while many methods provide reliable identification of polymers (and additives), the quantification is either mass-based or particle-based (delivering information on particle number, size/size distribution and shape). The characterization of specific properties/compounds (degradation state, surface properties, additives, products of weathering, sorbed chemicals, etc.) needs additional method(s). Hence, depending on desired information, one method or a combination of several methods is required.

Depending on the detection method(s) of choice, the complexity of samples to be analyzed and the level of contamination, suitable methods for the sampling, and sample preparation have to be considered to achieve representative and reliable results.

Analytic evaluation of microplastic in freshwater - µΠυ (64 - 85 / YGN), (0P88-300 LT), (310 - 09 STT)

Experiment: (Polyolefins) Polypropylene (wrappers, bottle caps) and polyethylene (plastic bag) collection of water and identifying traces of microplastic pollutants.
Region - Gauteng.
Period – 02/2018 – 08/2018
Sourced – water taps
Tests and sample collection - **185** tests performed, **83** samples collected per test a total **of 15335** samples.
Test results used – **12433**.
Elimination - **1817** tests (**495** due to duplication, **989** eliminated due to exclusion criteria, **333** by screening and analyzing the title).

Particle size range - 100 microns - 1 micron
Type of test – Raman Nicolet iN5 IR Microscope
Detecting traces of polyethylene, polypropylene
Used: analysis of fibres, particulates and inclusions. The use vibrational spectroscopy method is based on inelastic light scattering that provides information about detailed molecular structures.

Name	Typical Density (g/cm³)	Wavelength UV (nm)
Polypropylene	0.89	290 – 300, 330 - 370
Polyethylene	0.96	340 – 550

Compositional model

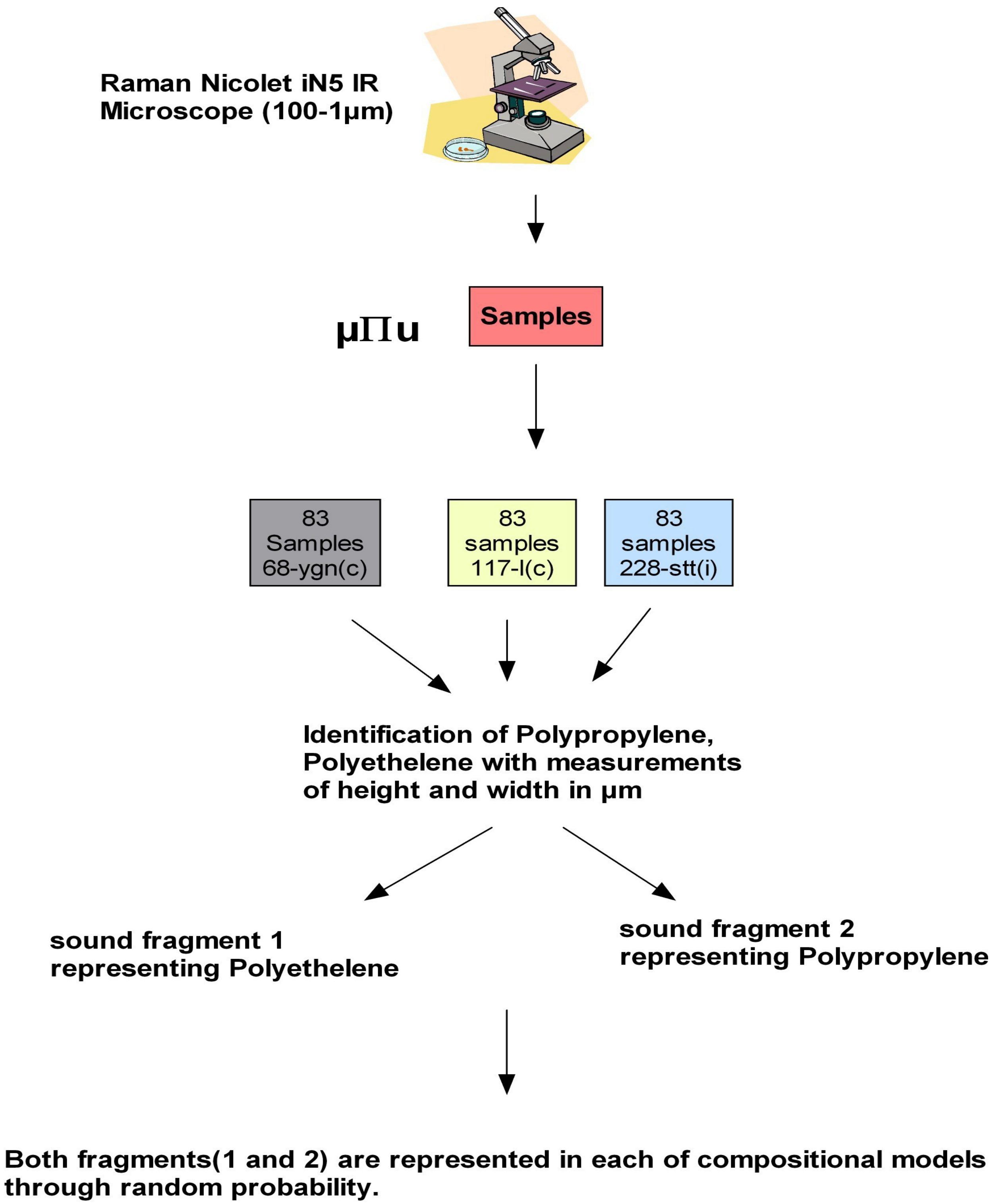
Detection of the 2 polymers based on identification due to height *(range is 100μm or 0.1mm - 1μm or 0.001mm)*, width *(range is 100μm or 0.1mm - 10μm or 0.001mm)*.

The area of the microplastics detected is not considered under examination of the 2D model. Each of the 2 polymers detected is identified by a selection of sound fragments or mico-beats at a specified pitch. The experiment aims to identify areas of constructive and destructive wave interference *(interference of waves causes the medium to take on a shape that results from the net effect of the two individual waves upon the particles of the medium).*

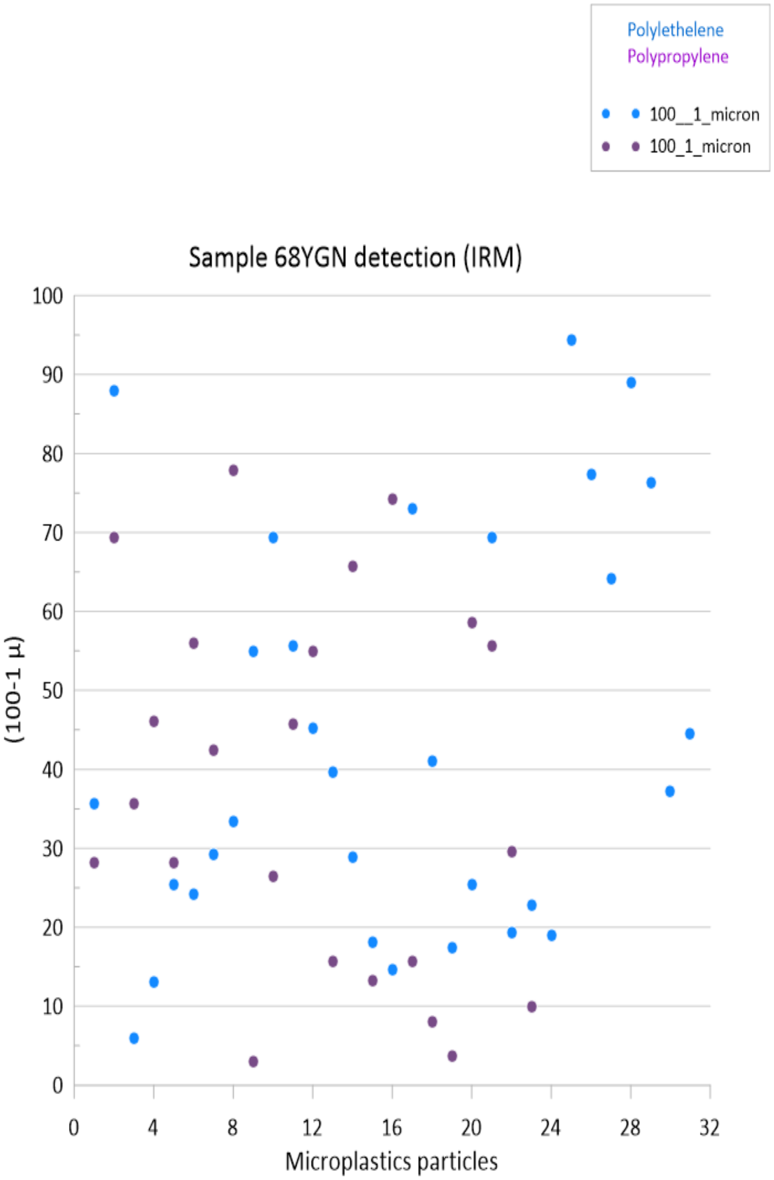
Waves of identical frequencies interfere in such a manner to produce points along the medium that always appear to be standing still and consist of an alternating pattern of nodes and antinodes so as pressure or applied frequency of vibrations increase so to the quantity of nodes/antinodes increase or visa versa, indicating a fluctuation of sound density. Higher sound density indicates cluster formations which intern could identify areas of microplastic data samples showing conglomeration of particles.
This technique follows exact sample procedures, data is implemented into the compositional model. The polymer population in areas of higher sound density can be represented by granular synthesis.

The computer as an assistant composer, selected files presented to it by equating probability functions using
In a random sampling method in which each member of the 2 populations has an equal chance of being included in the sample/s, a timeline is introduced to the equation. The 2 microplastic groups introduce (variations in height, and width (μm) at a given pitch).

The composer was free to either agree or disagree with the maladaptive or adaptive reasoning of these suggestions and made the appropriate changes.

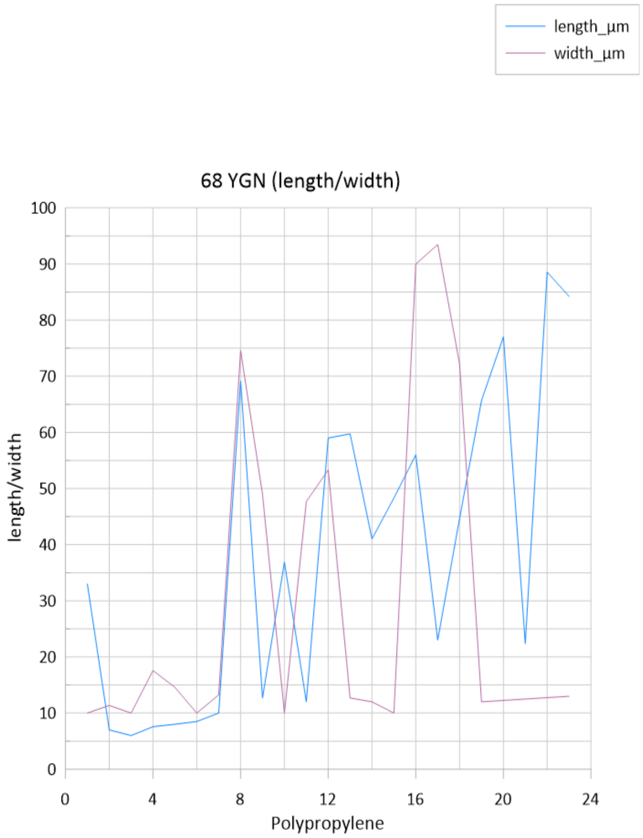


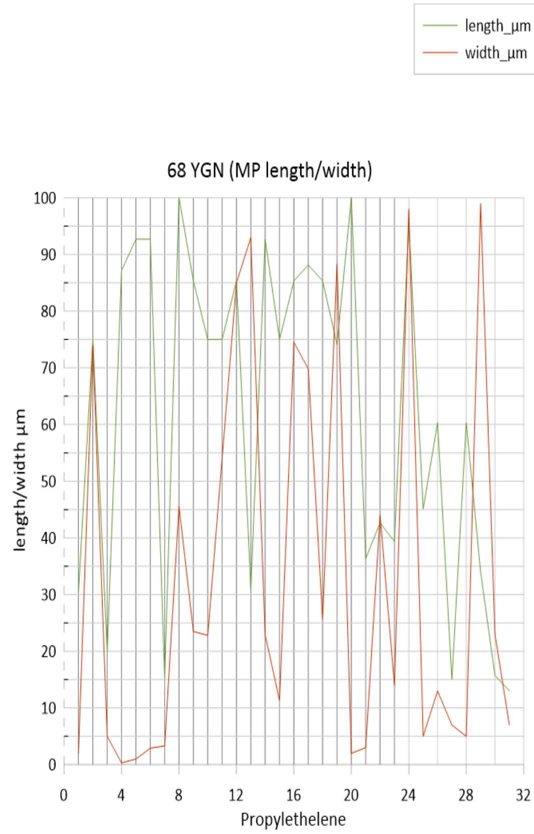
Gathering and dispersing of sample data



Polylethelene (100 -1 μ)	
1	35.67
2	87.93
3	5.9
4	13.12
5	25.45
6	24.17
7	29.16
8	33.4
9	54.93
10	69.33
11	55.66
12	45.13
13	39.67
14	28.94
15	18.19
16	14.56
17	73
18	41
19	17.36
20	25.47
21	69.33
22	19.38
23	22.74
24	18.94
25	94.37
26	77.39
27	64.23
28	89
29	76.3
30	37.3
31	44.56

Polypropylene (100-1 μ)	
1	28.23
2	69.33
3	35.67
4	46.12
5	28.19
6	56
7	42.36
8	77.8
9	3
10	26.39
11	45.67
12	54.93
13	15.65
14	65.68
15	13.33
16	74.23
17	15.69
18	8
19	3.75
20	58.63
21	55.66
22	29.56
23	10





Propylene	length µm	width µm
1	33	10
2	7	11.36
3	6	10
4	7.57	17.58
5	8	14.58
6	8.49	10
7	10	13.23
8	69.15	74.59
9	12.69	48.96
10	36.9	10
11	12	47.69
12	59	53.33
13	59.74	12.69
14	41.03	12
15	48.3	10
16	56	89.99
17	23	93.46
18	44.7	72.15
19	65.69	12
20	77.03	8
21	22.36	12.5
22	88.55	10
23	84.23	13

Propylethelene	length µm	width µm
1	30.4	2
2	75	74
3	19.88	5
4	87.18	0.3
5	92.68	1
6	92.68	2.9
7	15.18	3.3
8	100	45.6
9	85.35	23.5
10	75	22.8
11	75	54
12	85.35	85
13	31.05	93
14	92.68	22.9
15	75	11.33
16	85.35	74.5
17	88.13	69.83
18	85.35	25.69
19	74.13	88.36
20	100	2
21	36.35	3
22	42.67	44
23	39.35	14
24	95.71	98
25	45.07	5
26	60.35	13
27	15	7
28	60.35	5
29	33.93	99
30	15.71	23
31	13.03	7

References

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2. Kanyathare, B.; Asamoah, B.O.; Ishaq, U.; Amoani, J.; Räty, J.; Peiponen, K.E. Optical transmission spectra study in visible and near-infrared spectral range for identification of rough transparent plastics in aquatic environments. Chemosphere **2020**, 248, 126071.
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