



QUANTIFICATION AND CHARACTERIZATION OF ATMOSPHERIC SMALL MICROPLASTICS (<math>< 100 \mu\text{M}</math>)

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WITH BEATRICE ROSSO AND PROF. ANDREA GAMBARO

**In: Atmospheric
micro-nanoplastics**

With Dr. Matteo Rinaldi, CNR-ISAC Bologna

■
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Microplastics' Lab



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Microplastics' Lab

- ❖ A novel method for purification, quantitative analysis and characterization of microplastic fibers using Micro-FTIR. F. Corami, B Rosso, B Bravo, A Gambaro, C Barbante. *Chemosphere* 238, 124564
DOI: <https://doi.org/10.1016/j.chemosphere.2019.124564>
- ❖ First evidence of microplastics ingestion in benthic amphipods from Svalbard. V Iannilli, V Pasquali, A Setini, F. Corami. *Environmental research* 179, 108811
DOI: <https://doi.org/10.1016/j.envres.2019.108811>
- ❖ Microplastic accumulation in benthic invertebrates in Terra Nova Bay (Ross Sea, Antarctica). AA Sfriso, Y Tomio, B Rosso, A Gambaro, A Sfriso, F Corami, E Rastelli, C Corinaldesi, M Mistri, C Munari. *Environment International* 137, 105587
DOI: <https://doi.org/10.1016/j.envint.2020.105587>
- ❖ Plastic abundance and seasonal variation on the shorelines of three volcanic lakes in Central Italy: can amphipods help detect contamination? V Iannilli, F Corami, P Grasso, F Lecce, M Buttinelli, A Setini. *Environmental Science and Pollution Research*, 1-12. DOI: <https://doi.org/10.1007/s11356-020-07954-7>
- ❖ Evidence of small microplastics (<100 µm) ingestion by Pacific oysters (*Crassostrea gigas*): A novel method of extraction, purification, and analysis using Micro-FTIR. F. Corami, B. Rosso, M. Roman, M. Picone, A. Gambaro, C. Barbante. *Marine Pollution Bulletin*, 160, November 2020, 111606. DOI: <https://doi.org/10.1016/j.marpolbul.2020.111606>

Macroplastics



Mesoplastics

Microplastics



How small can microplastics be?

ECHA 2019

«solid material containing polymers, to which additives or other substances may have been added»



Particles: 1nm- 5mm
Fibers: 3nm- 15mm

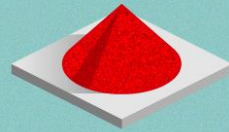
SOURCES OF
PRIMARY MICROPLASTICS / A



Facial
cleansers



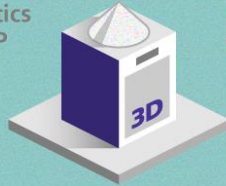
Cosmetics
& PCP



Plastic
pellets



Industrial
abrasives



3D printing
powder

SOURCES OF
PRIMARY MICROPLASTICS / B



Car and
truck tires



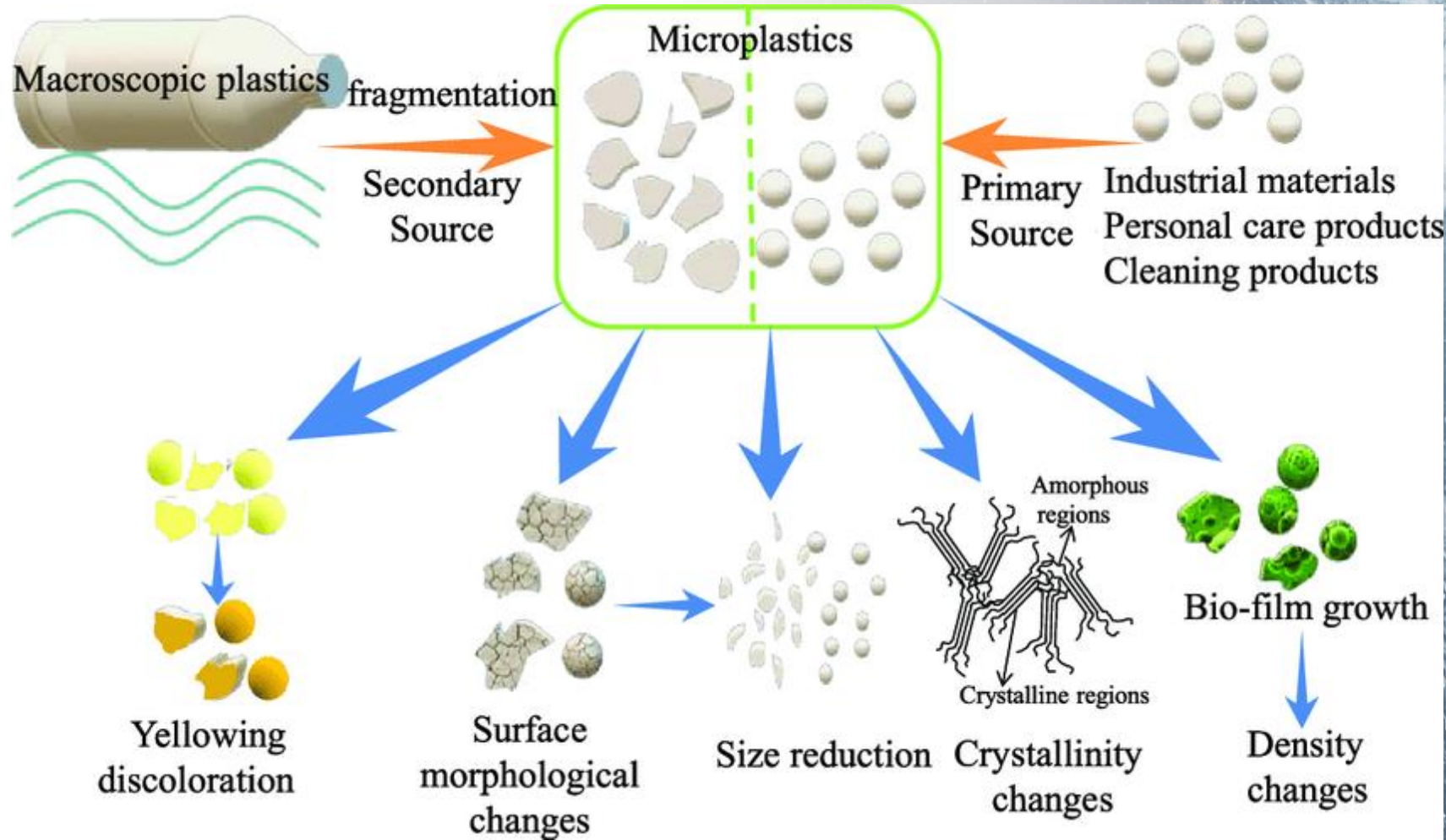
Textile fibers that
detach of synthetic
fabrics

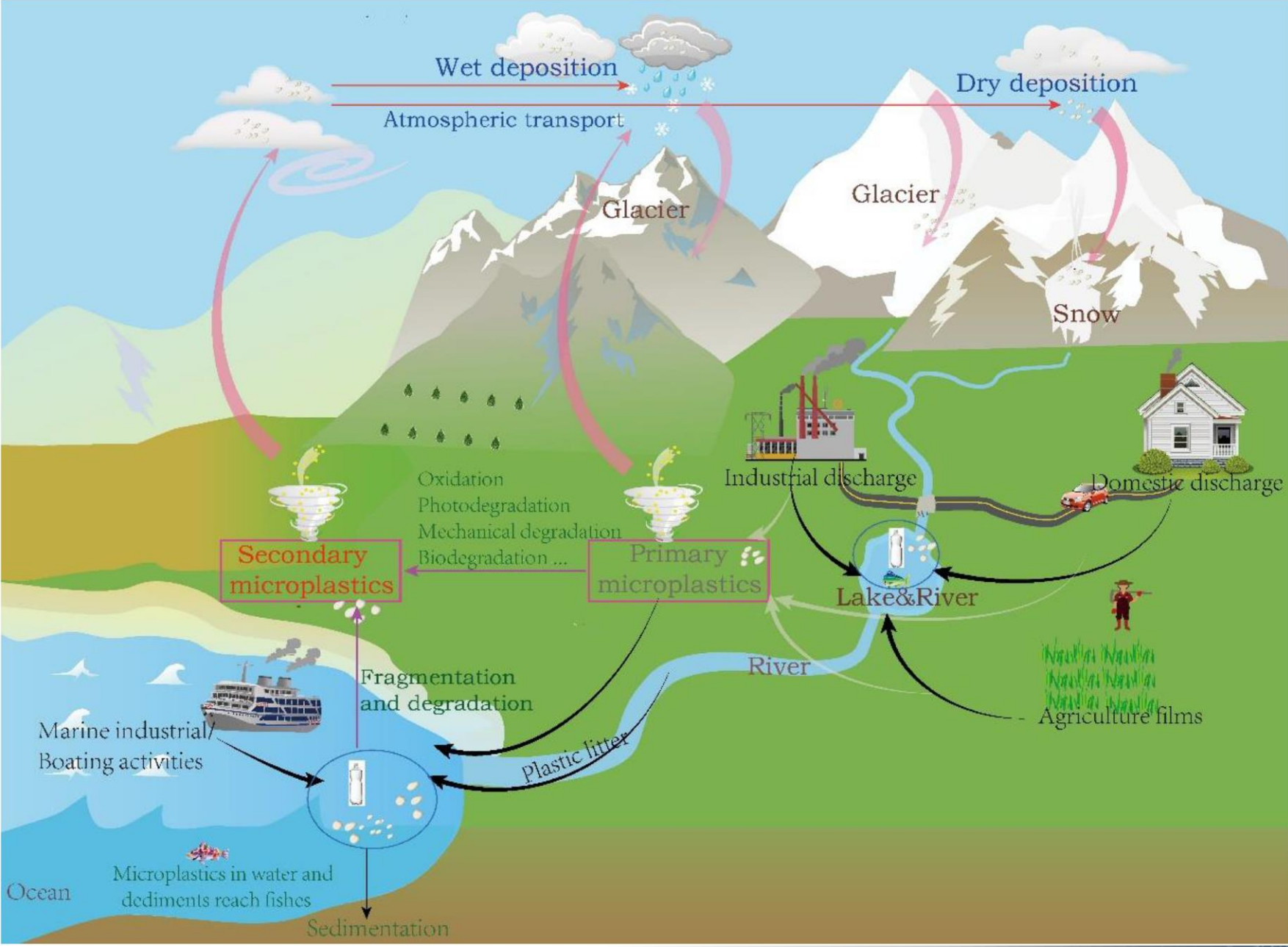


City dust

PRIMARY MICROPLASTICS

SECONDARY MICROPLASTICS





From Yulan Zhang, Tanguang Gao, Shichang Kang, Mika Sillanpää
 Environmental Pollution, 254, 2019, 112953
<https://doi.org/10.1016/j.envpol.2019.07.121>



plastic free Clean Room (ISO 7)

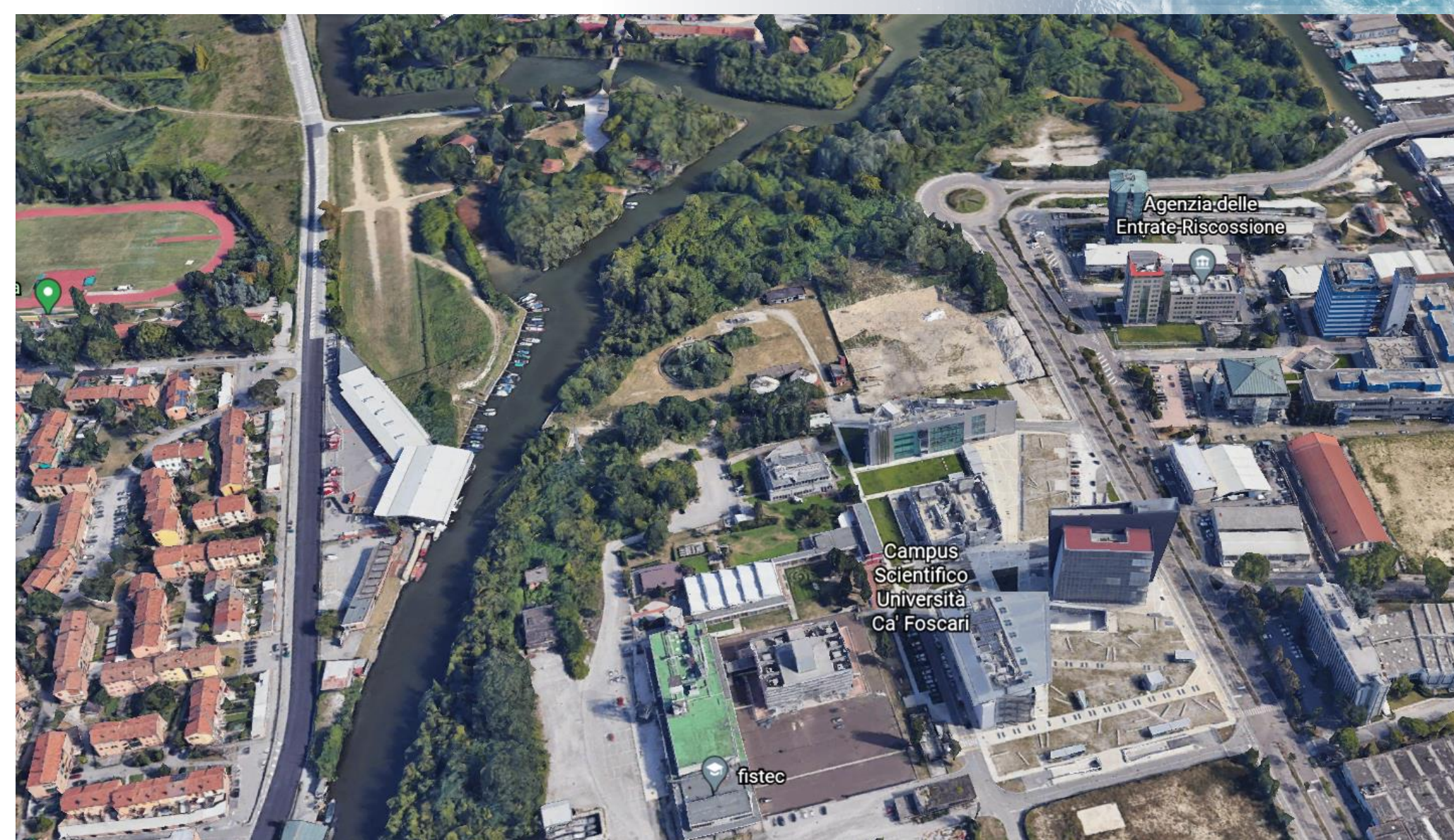
**DEVELOPMENT OF A
METHOD FOR
QUANTIFICATION
AND
CHARACTERIZATION
OF AIRBORNE
SMALL
MICROPLASTICS
($< 100 \mu\text{m}$) USING
MICRO-FTIR.**



From Corami et al. Airborne Small Microplastics ($< 100 \mu\text{m}$): a novel method for quantification and characterization using Micro-FTIR IN PREPARATION

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From Corami et al. Airborne Small Microplastics (< 100 μm): a novel method for quantification and characterization using Micro-FTIR
IN PREPARATION

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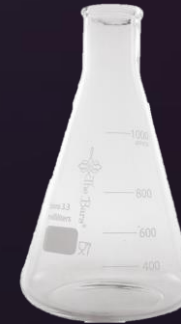
DEVELOPMENT OF A METHOD FOR QUANTIFICATION AND CHARACTERIZATION OF AIRBORNE SMALL MICROPLASTICS (< 100 μm) USING MICRO-FTIR.



HIGH VOLUME TSP SAMPLER



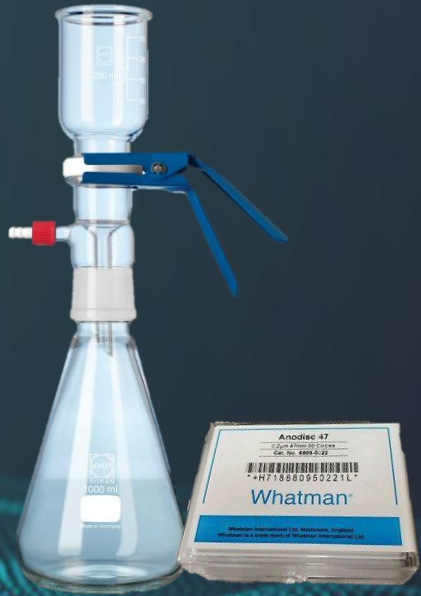
QUARTZ FIBER FILTERS



ELUTRIATION AND EXTRACTION

FILTRATION AND PURIFICATION

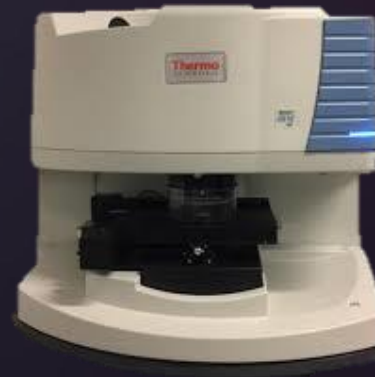
FILTRATION AND PURIFICATION



FILTER DRYING



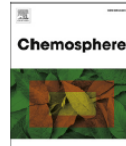
ANALYSIS



MICRO-FTIR
(μ FTIR)



plastic free Clean Room (ISO 7)



A novel method for purification, quantitative analysis and characterization of microplastic fibers using Micro-FTIR

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^b Department of Environmental Sciences, Informatics and Statistics, Ca' Foscari University of Venice, Via Torino, 155, 30172, Venezia-Mestre, Italy

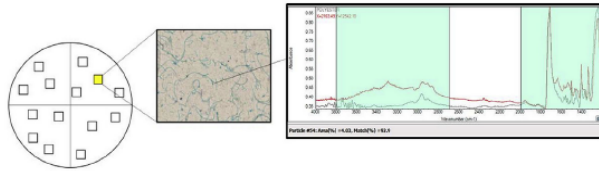
^c Thermo Fisher Scientific Spa, Strada Rivoltana, 20090 Rodano, Italy



HIGHLIGHTS

- Microplastics are quantified and simultaneously identified with Micro-FTIR.
- A purification step improves the quantification and the identification of fibers.
- Anodisc filters (0.2 μm) allow the retention of very small fibers.
- Polyester release is preeminent compared to that of polyamide.

GRAPHICAL ABSTRACT



ARTICLE INFO

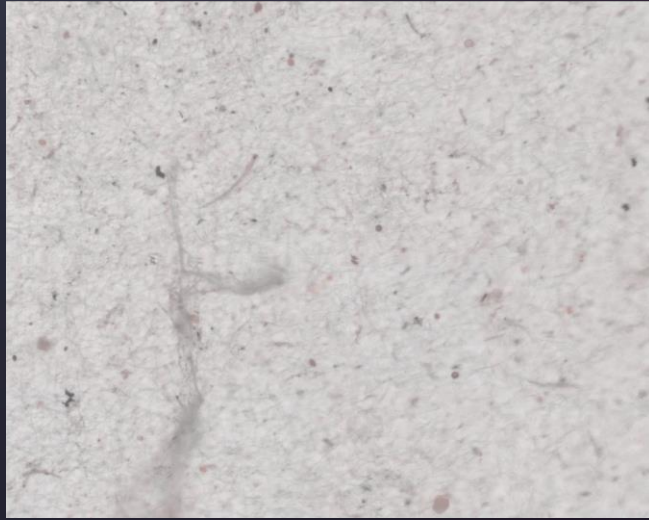
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ABSTRACT

Microplastics pose a worldwide risk for the environment. Microplastic fibers, which are released during the household washing of synthetic fabrics, are a substantial percentage of microplastics in rivers and in oceans. A novel quantification and simultaneous identification of fiber polymers via Micro-FTIR (Fourier Transform Infrared Spectroscopy) was developed. Washing simulations with commercially available

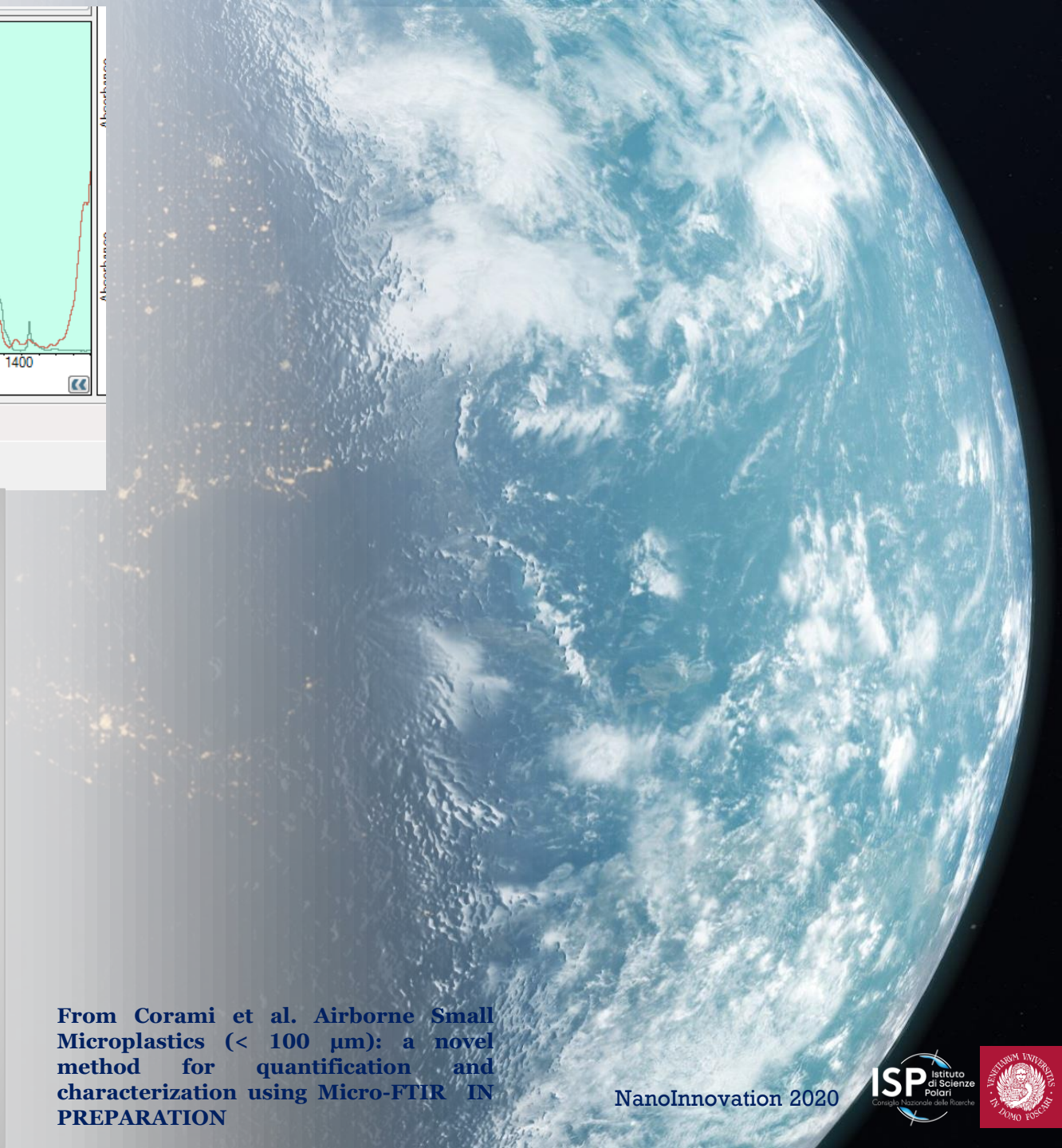
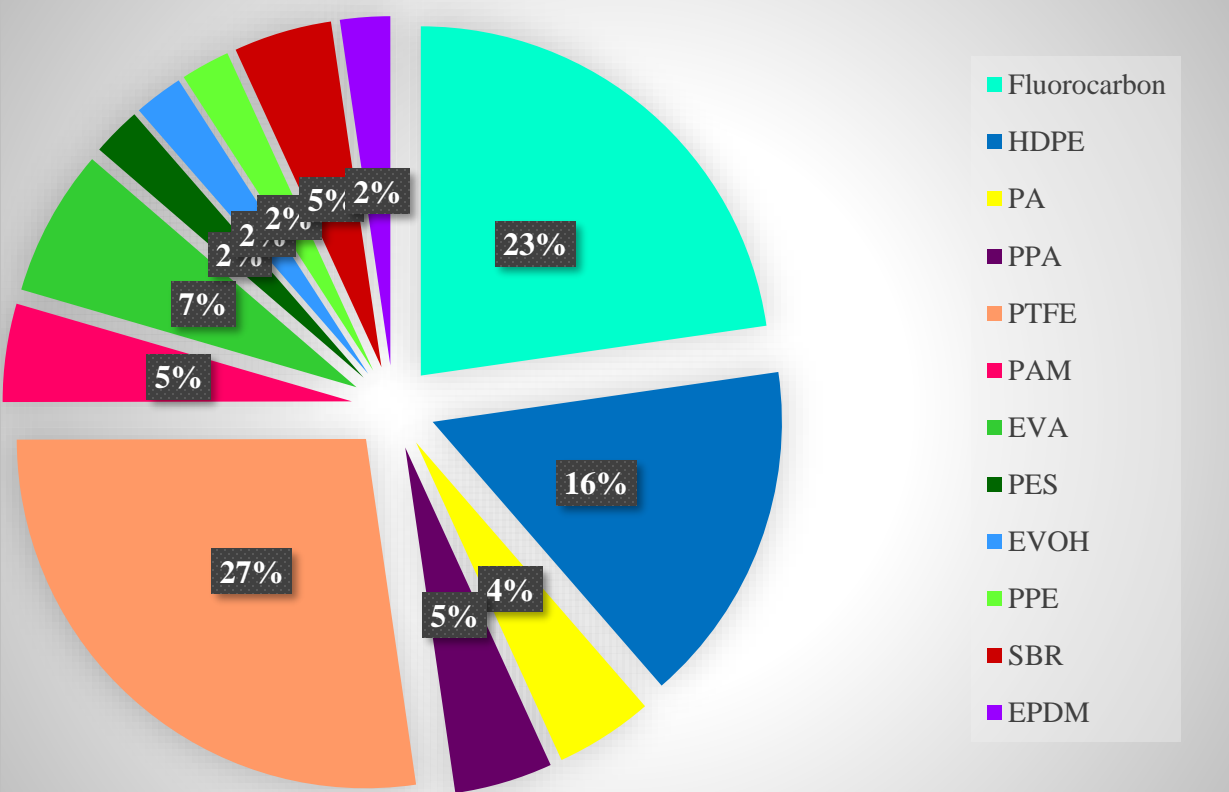
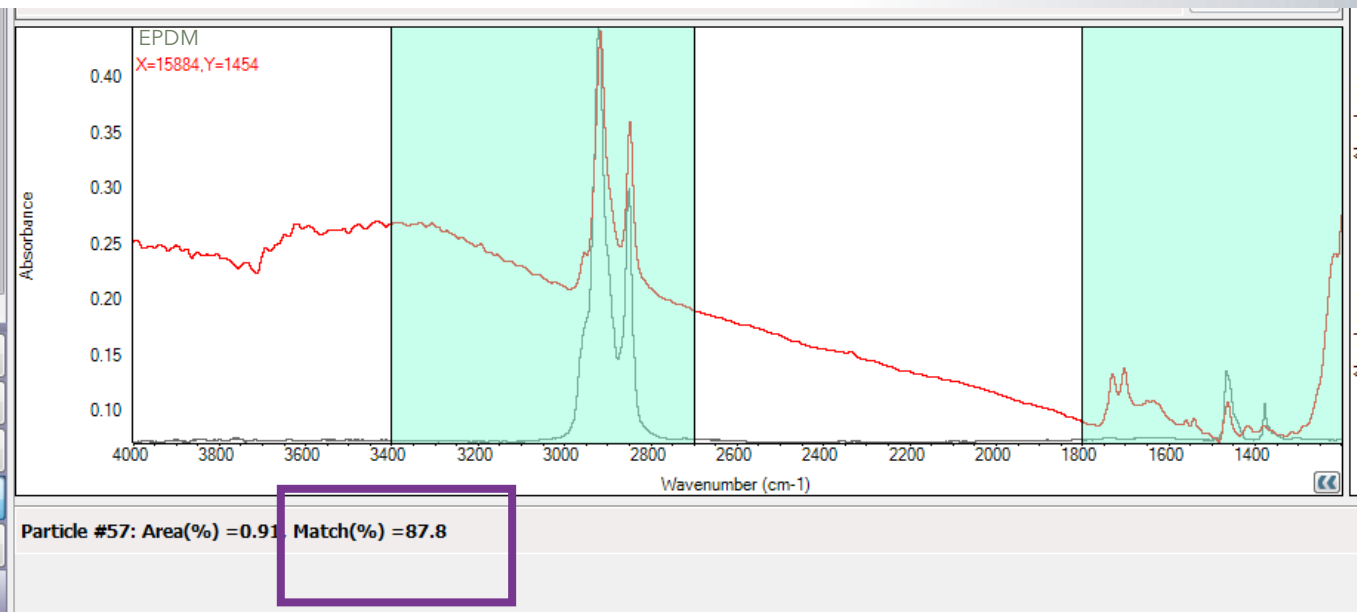
Formulae for quantification according to Corami et al. (2020)

EACH SAMPLE IS ANALYSED AT LEAST IN DUPLICATE
REAGENT BLANKS, FIELD BLANKS AND PROCEDURAL BLANKS
POISSON DISTRIBUTION

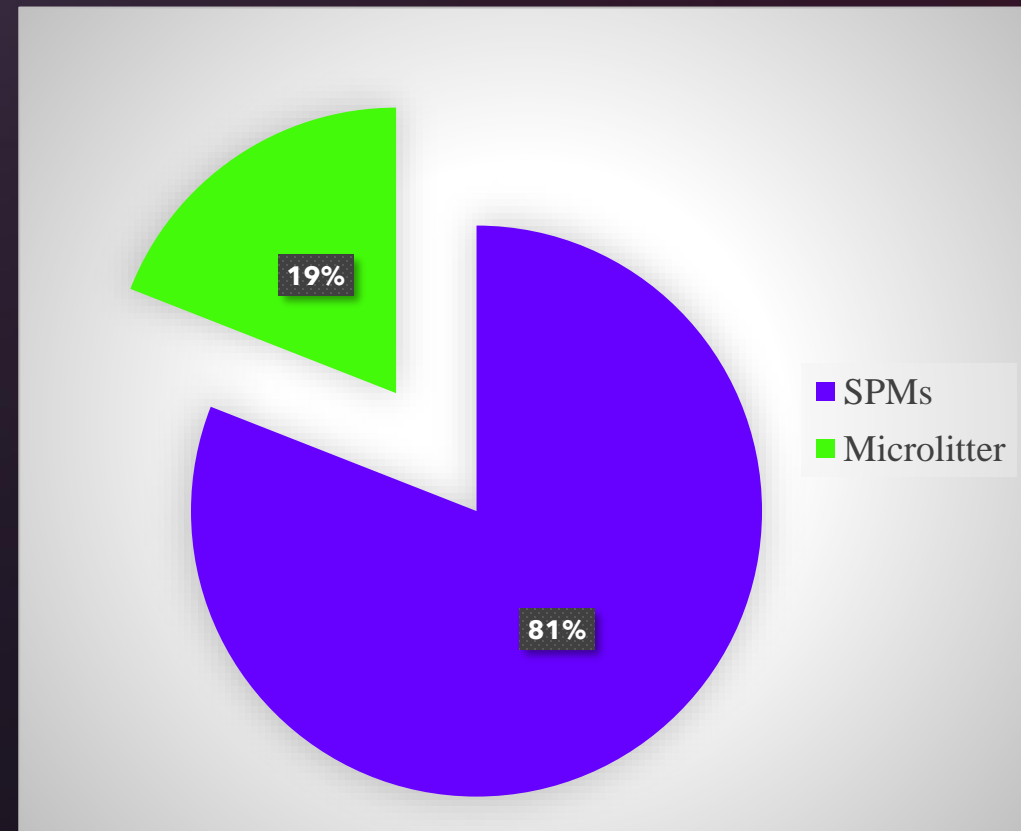
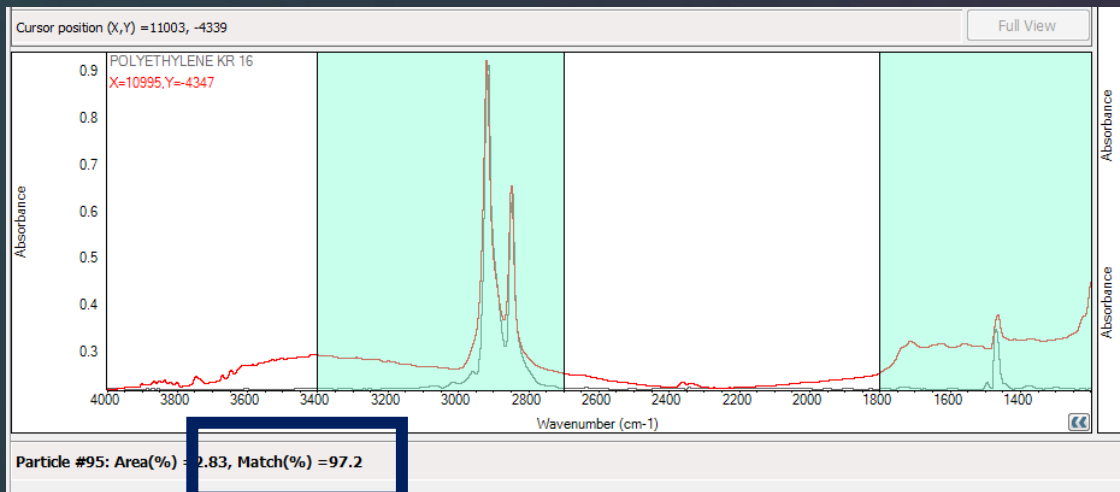


A SET OF DIFFERENT EXPERIMENTS TO FIND THE BEST PRETREATMENT PARAMETERS





From Corami et al. Airborne Small Microplastics (< 100 μm): a novel method for quantification and characterization using Micro-FTIR IN PREPARATION



CONCLUSIONS

-Microplastics and microlitter can be identified and quantified with the method developed

-The method does not employ strong oxidizing agents or high temperature

-Purification improves the spectral match percentage of IR spectra

-Reliable and reproducible method

-Size range of SMPs: $5 \mu\text{m} \leq x \leq 100 \mu\text{m}$

**THANK YOU FOR YOUR ATTENTION
ANY QUESTION?**



THE BRUGES WHALE



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