Towards a fast characterization method for large sampling high throughput microplastics identification

UNESCO-IWRA ONLINE CONFERENCE 17-19 JANUARY 2023 3rd IN THE IWRA ONLINE CONFERENCE SERIES

Sub-theme 5

MOTIVATION

To measure the effectiveness of public politics regarding the actions of combating plastic pollution, there is a need for monitoring the environment and creating indicators, for example, the temporal abundance of microplastics (MP) in a specific area of interest. An analytical microplastic identification by near-infrared hyperspectral imaging (HSI-NIR) that can assist the development of pollution indicators is presented.

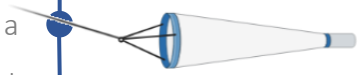
POLICY IMPLICATIONS

The speed of simultaneous chemical identification without subjectivity is feasible for monitoring demands.

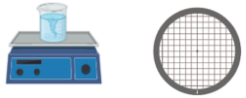
ANALYTICAL PROTOCOL

LARGE MICROPLASTICS (1-5 mm) IN RIVERS

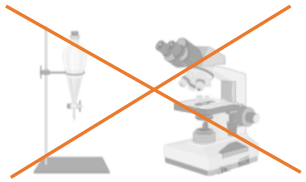
*Smaller particles (MP< 1 mm) have other protocol



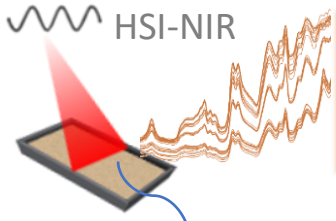
Sampling



Digestion| Fe^{2+}, H^+, H_2O_2
Sieving at target size



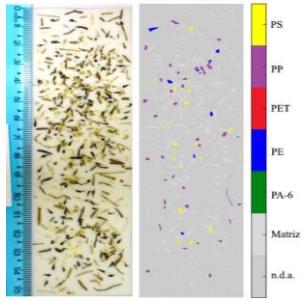
SKIP and save time
No density separation,
No previous sorting
No visual inspection



Line-scan
HSI-NIR analyzes
75 cm² of scanning area
in less than ONE minute!

Time analysis *depends on the scanning area, analyzing as many particles as fit in the area*

MP SIMULTANEOUS IDENTIFICATION

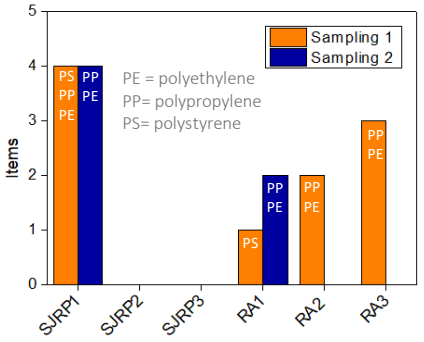


A supervised classification model was developed for MP identification, which is a tendency for automated analysis.[1]

[1]*Vidal, C.; Pasquini, C.* A comprehensive and fast microplastics identification based on near-infrared hyperspectral imaging (HSI-NIR) and chemometrics. *Env. Pollution*, 285 (2021) 117251. DOI 10.1016/j.envpol.2021.117251

CASE STUDY: SÃO PAULO-BRAZIL RIVERS

Surface water was collected in two cities (São José do Rio Preto - SJRP and Campinas) in two sampling campaigns:



All urban sampling points had from 1 to 4 large MP/m³ at least once in sampling periods.

Ongoing work for analyzing smaller microplastics, aiming at 300 µm size detection limit.

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