

Measurement of Se content in algal cells

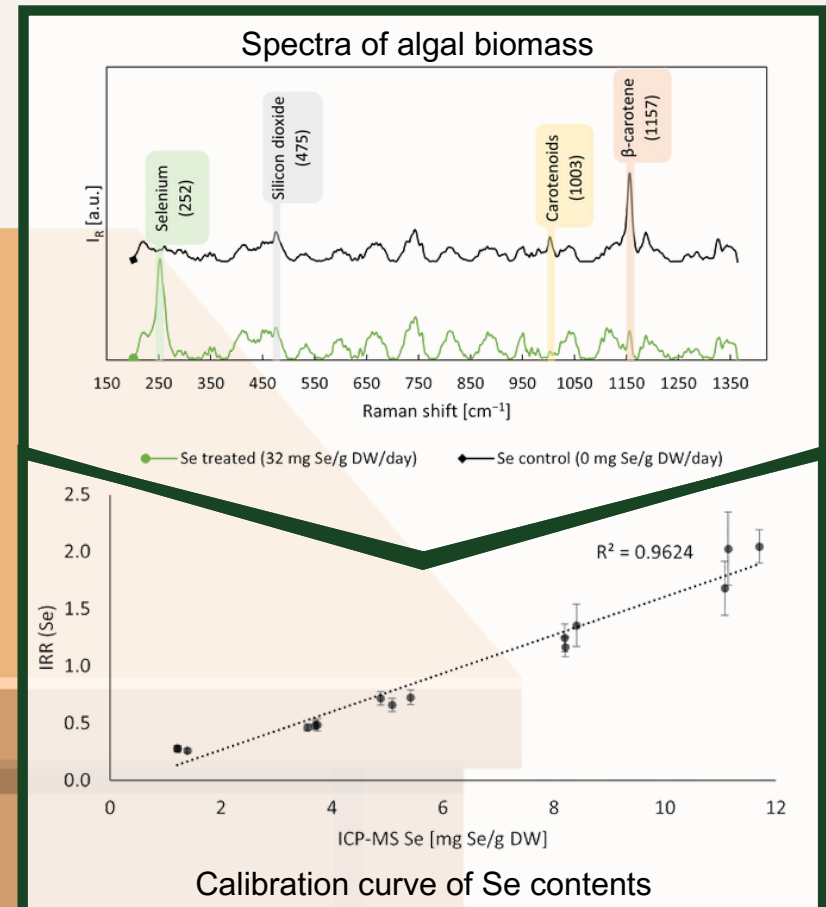
Selenium

- essential micronutrient
- antioxidant, cancer prevention
- narrow gap between beneficial x toxic dose
- sources:

Food supplementation - microalgae (*Chlorella vulgaris*) cultivated in Se-rich environment. Often analyzed with mass spectroscopy.

Raman microspectroscopy

Non-destructive method for faster analyses. Detection of selenium concentration in algal biomass.



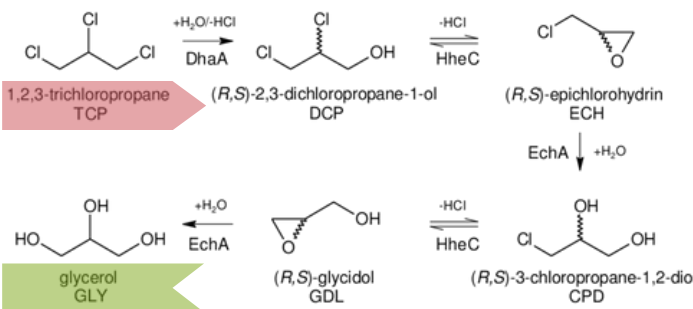
Kizovský, M. et al. Raman Microspectroscopic Analysis of Selenium Bioaccumulation by Green Alga *Chlorella vulgaris*. Biosensors 2021, <https://doi.org/10.3390/bios11040115>



Analysis of enzymatic dehalogenation

TCP enzymatic degradation

haloalkane dehalogenase (DhaA)
halohydrine dehalogenase (HheC)
epoxid hydrolase (EchA)



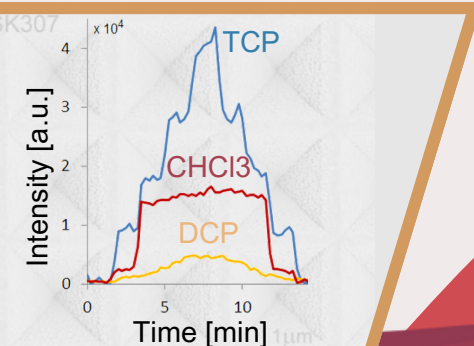
1,2,3-trichloropropane (TCP)
Widely used in industry. Leaks into soils and ground water. Considered being a likely carcinogen.

Degradation of TCP by a set of enzymes to form harmless glycerol.

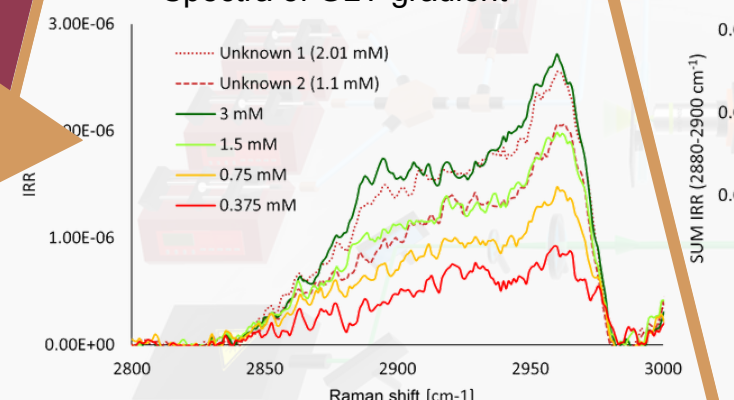
SERS analysis:
Nanostructured gold plated surface for TCP signal increase.

High-power Raman:
Submillimolar detection of GLY in simulated reaction solution.

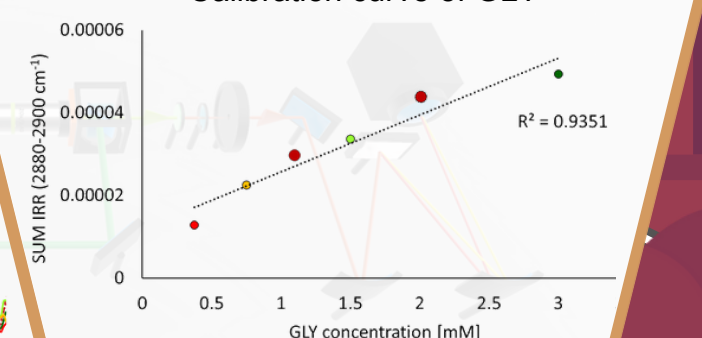
Timeline of chloroalkanes detection



Spectra of GLY gradient



Calibration curve of GLY



Pilát, Z. et al. Detection of Chloroalkanes by Surface-Enhanced Raman Spectroscopy in Microfluidic Chips. Sensors 2018, <https://doi.org/10.3390/s18103212>



Micro and nanoplastics detection

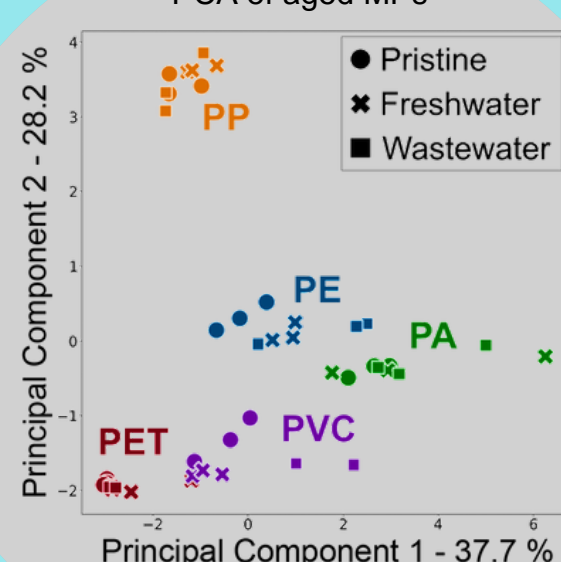
Microplastics Nanoplastics

Primary:
produced intentionally (daily care products)

Secondary:
degrade from plastics (mechanical abrasion and UV radiation)

Contamination is spread worldwide. Standardized detection methods focus on +20 µm particles.

PCA of aged MPs



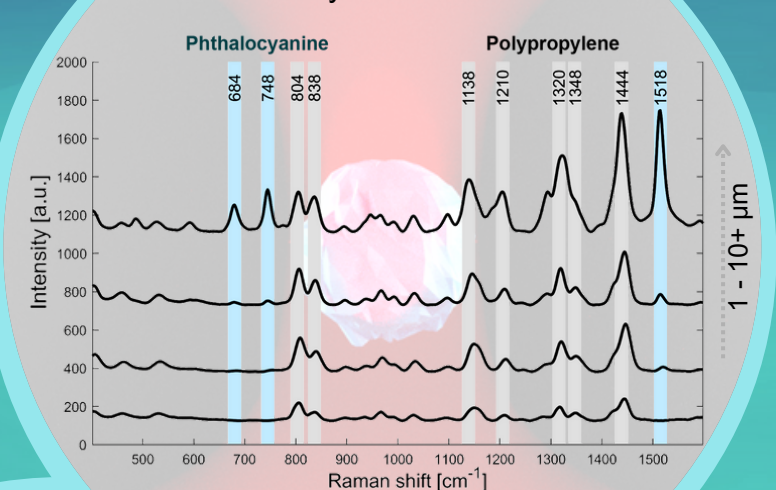
Advanced Raman techniques

Microspectroscopy:
chemical speciation of particles made from different plastics

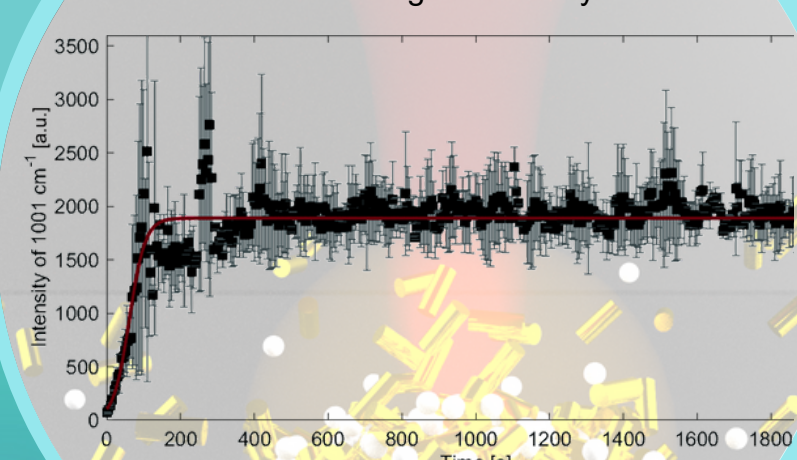
Raman tweezers (RT):
analysis of debris from degraded facemask in liquid environment

Optical aggregation:
detection of polystyrene beads with dimensions in order of tens of nm

Spectra of facemask MPs analyzed with RT



Increase of polystyrene Raman signal intensity



Pořízka, P. et al. Laser-based techniques: Novel tools for the identification and characterization of aged microplastics with developed biofilm, Chemosphere 2023, <https://doi.org/10.1016/j.chemosphere.2022.137373>

