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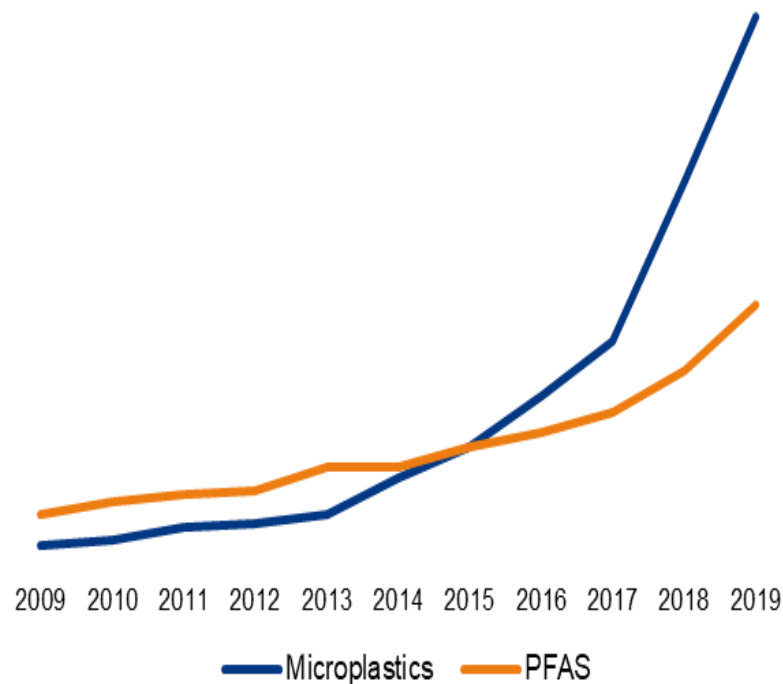
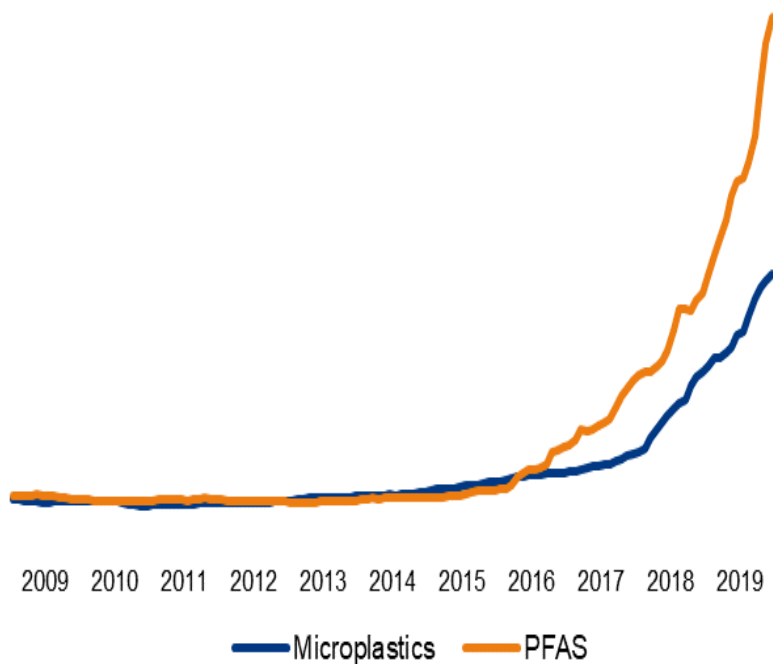
Mikroplast og gummipartikler i rent vann og avløpsvann

Joakim Skovly

Eurofins Environment Testing Norway, Bergen

Google search trend

Google Scholar Citations



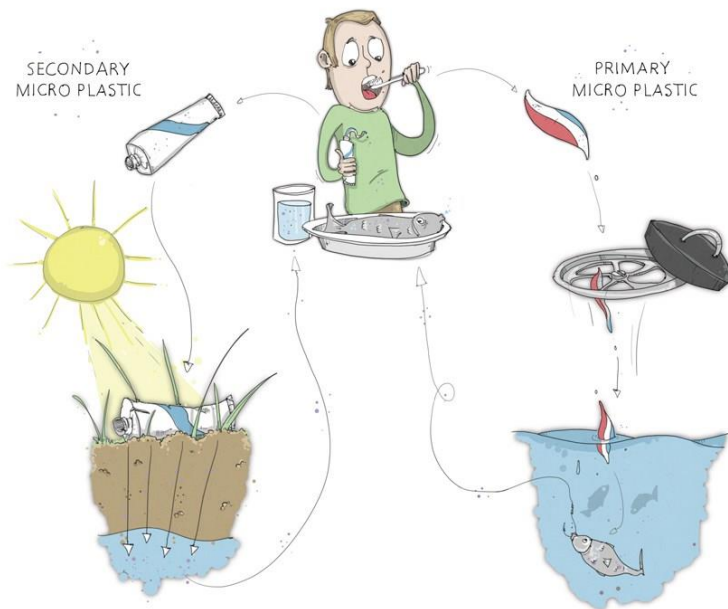
Google search trend, <https://trends.google.com/>
Google scholar, <https://scholar.google.com/>

- Kilder til mikroplast
 - Analyse av mikroplast i vannprøver
 - Analyseprodukter og utvikling
- Makroplast: > 5mm
 - Mikroplast: 5mm – 100nm
 - Nanoplast: 100nm – 1nm

Primær mikroplast:
Plastbiter produsert i mikroskala

Sekundær mikroplast:
Dannes ved nedbrytning av større
plastbiter.

Finnes stort sett overalt



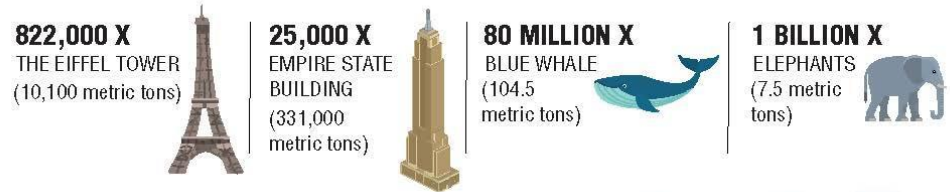
Plastforurensning

- ~ 8.5 mrd. tonn plast produsert siden 50-tallet.
 - ~ 75% av dette er avfall
- Årlig produksjon > 320 mill tonn, hvor
 - ~ 40% er engangsplast
- ~ 8 – 10 mill. tonn plast havner i havet årlig

A clearer picture of plastics

Humans have created about 8.3 billion metric tons of plastics to date, outgrowing all man-made materials other than steel and cement.

How heavy is 8.3 billion metric tons?



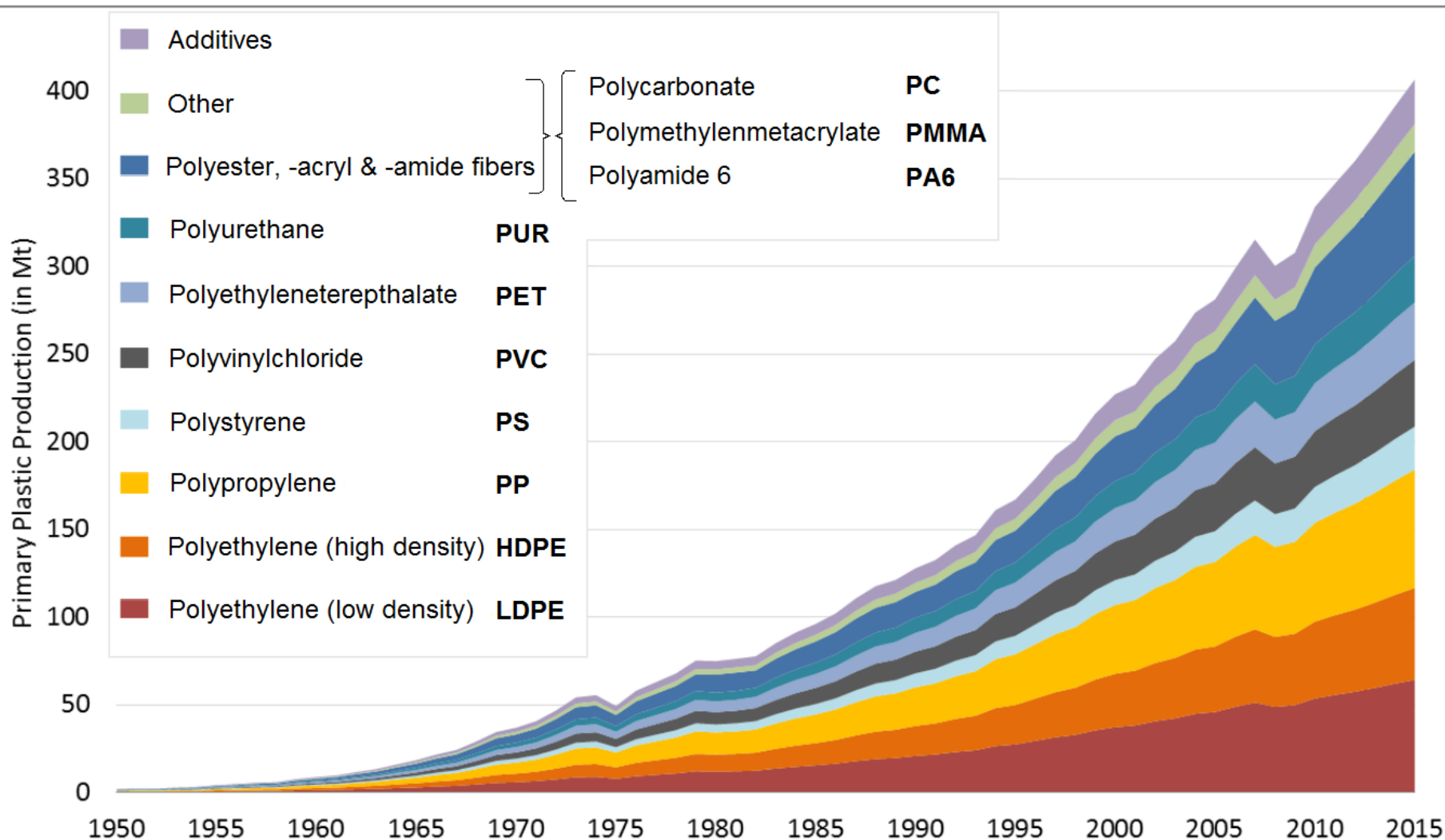
The rapid rise of plastics

A world without plastics seems unimaginable today, yet their large-scale production and use only dates back to around 1950.

GLOBAL PLASTIC PRODUCTION ESTIMATES

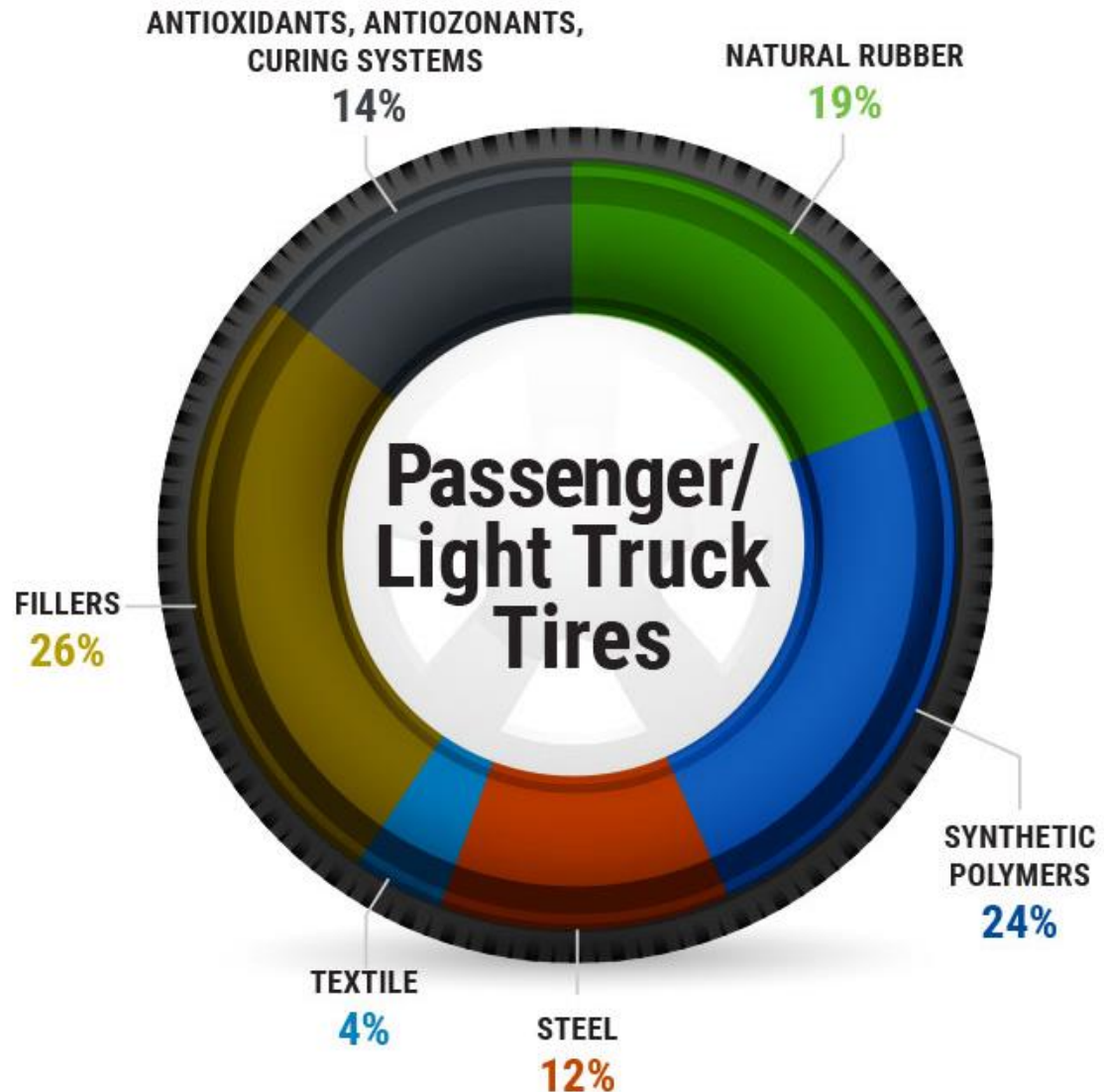


Global plastproduksjon




Global primary plastic production (in million metric tons) according to polymer type from 1950 to 2015.

- Betydelig kilde til mikroplastforurensning
- Ulike blandingsforhold, men stort sett like komponenter i de fleste bildekk.
- Polyisopren og polybutadien kan brukes som indikatorforbindelser



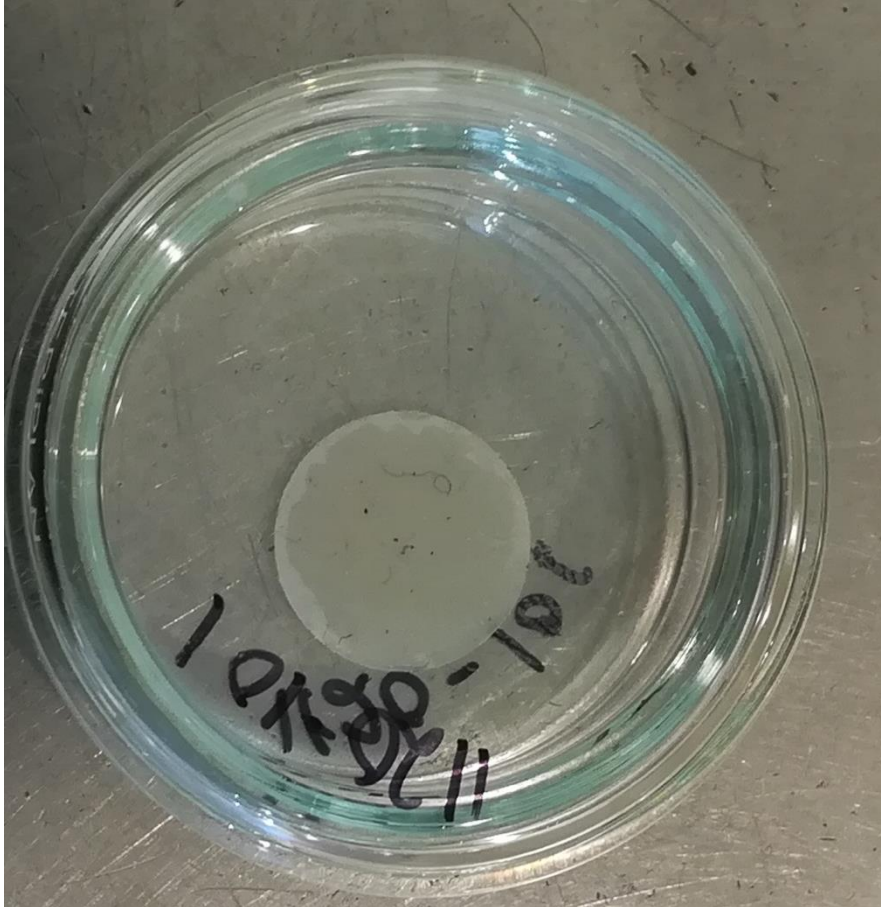
Simultaneous Trace Identification and Quantification of Common Types of Microplastics in Environmental Samples by Pyrolysis-Gas Chromatography–Mass Spectrometry

Marten Fischer and Barbara M. Scholz-Böttcher^{*,†} 

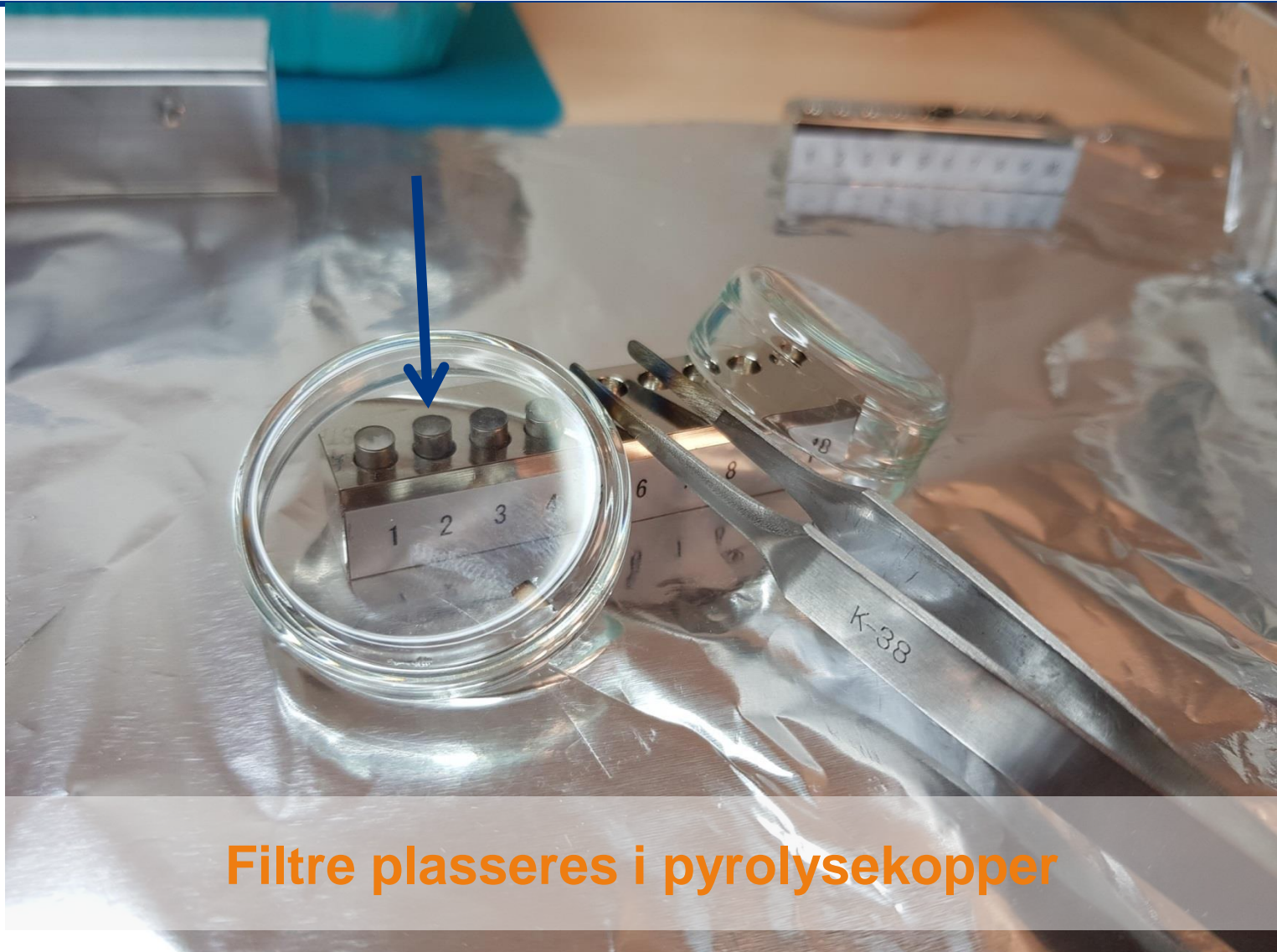
Institute for Chemistry and Biology of the Marine Environment (ICBM), Carl von Ossietzky University of Oldenburg, P.O. Box 2503, D-26111 Oldenburg, Germany

- Prøveopparbeidelse i polymerfritt miljø
- Spesialtilpasset utstyr for mikroplastanalyser
- Vann og væske filtreres gjennom 0,2 - 42µm filter





Filtrering av 1L springvann gjennom 0,2 μ m filter



Filtre plasseres i pyrolysekopper

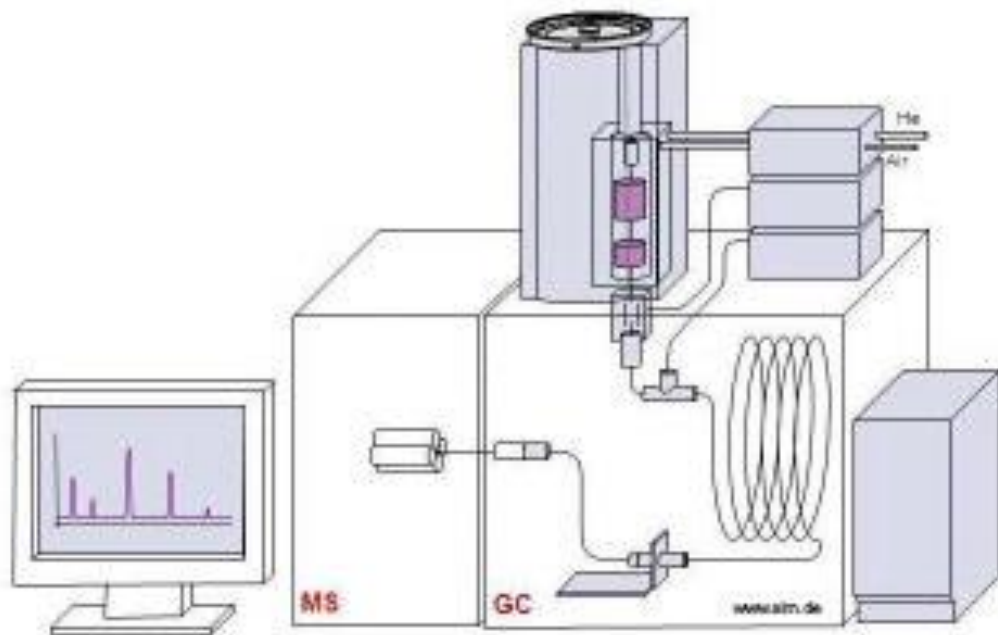
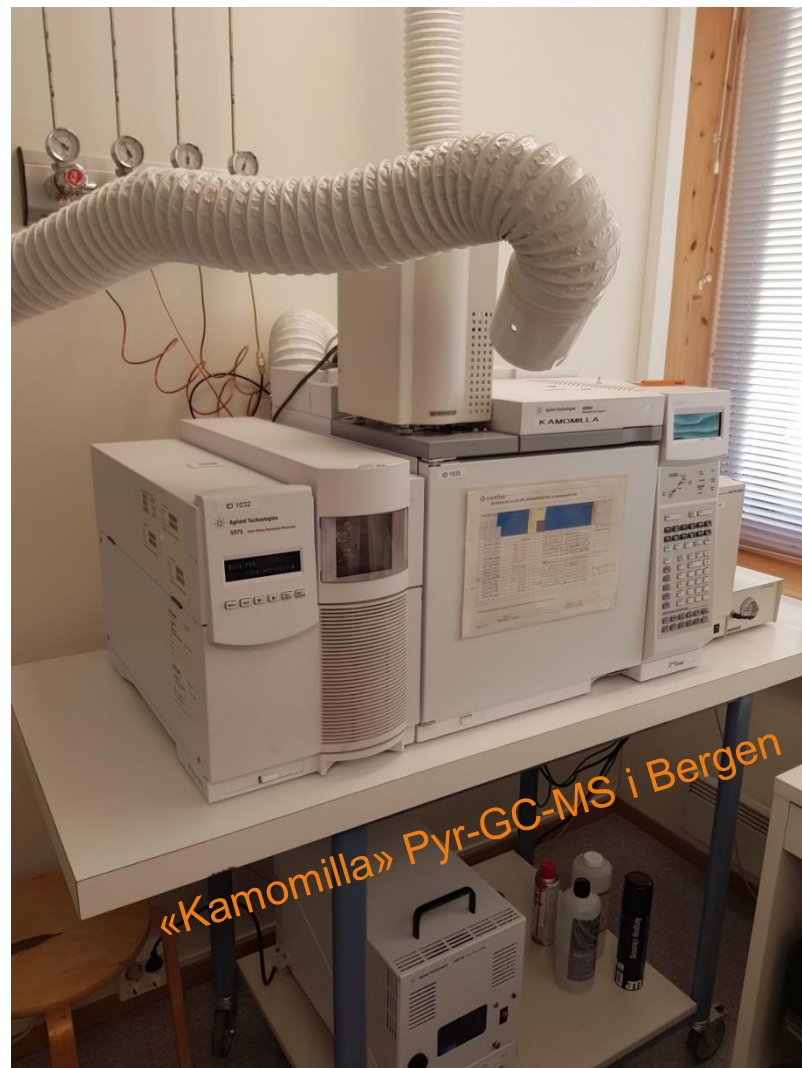
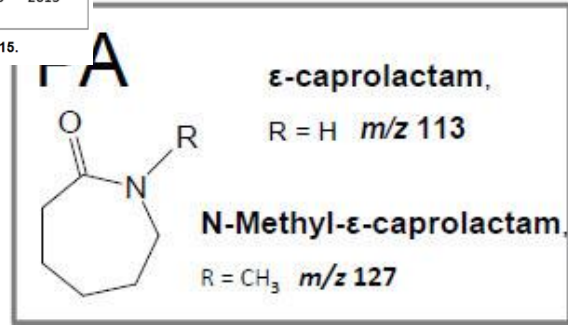
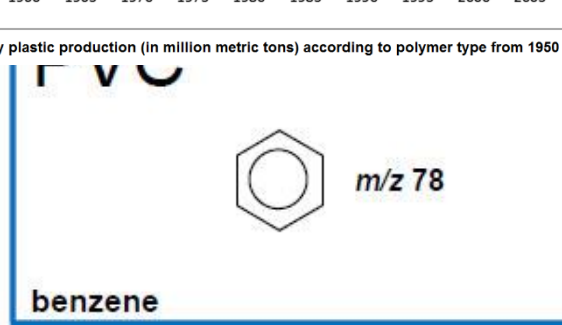
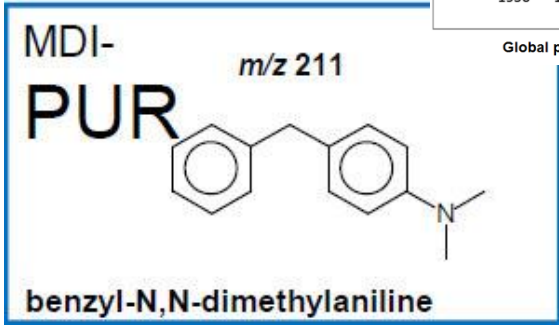
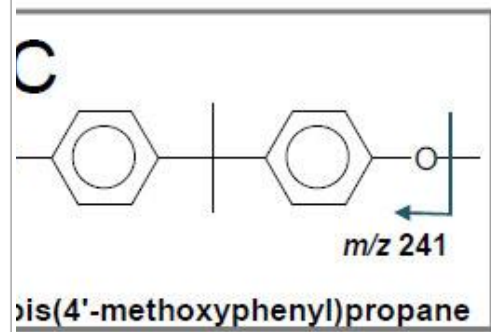
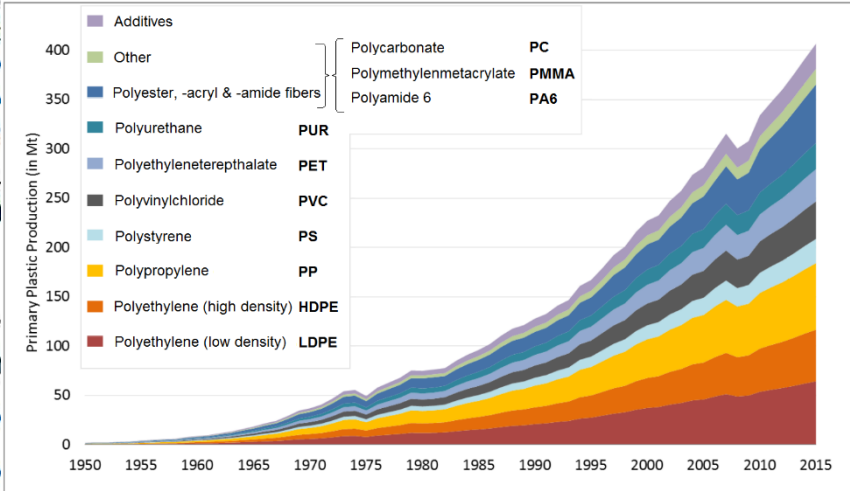
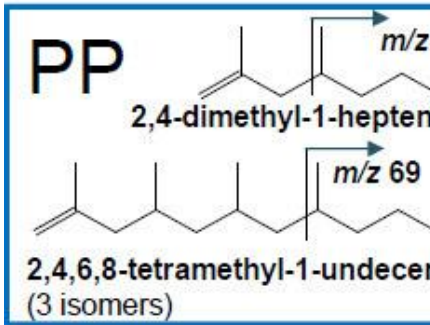
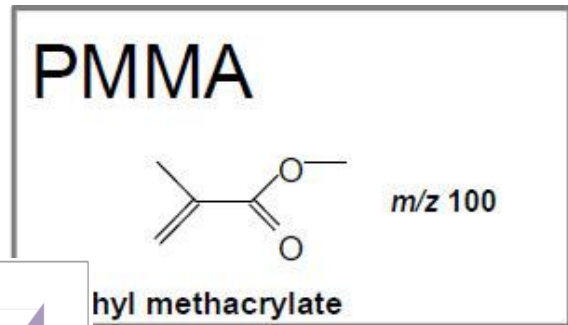
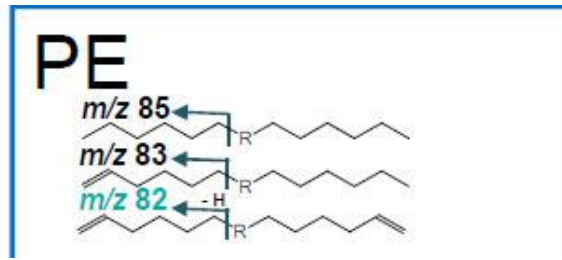
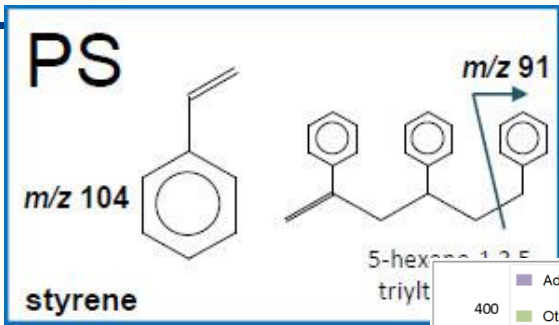
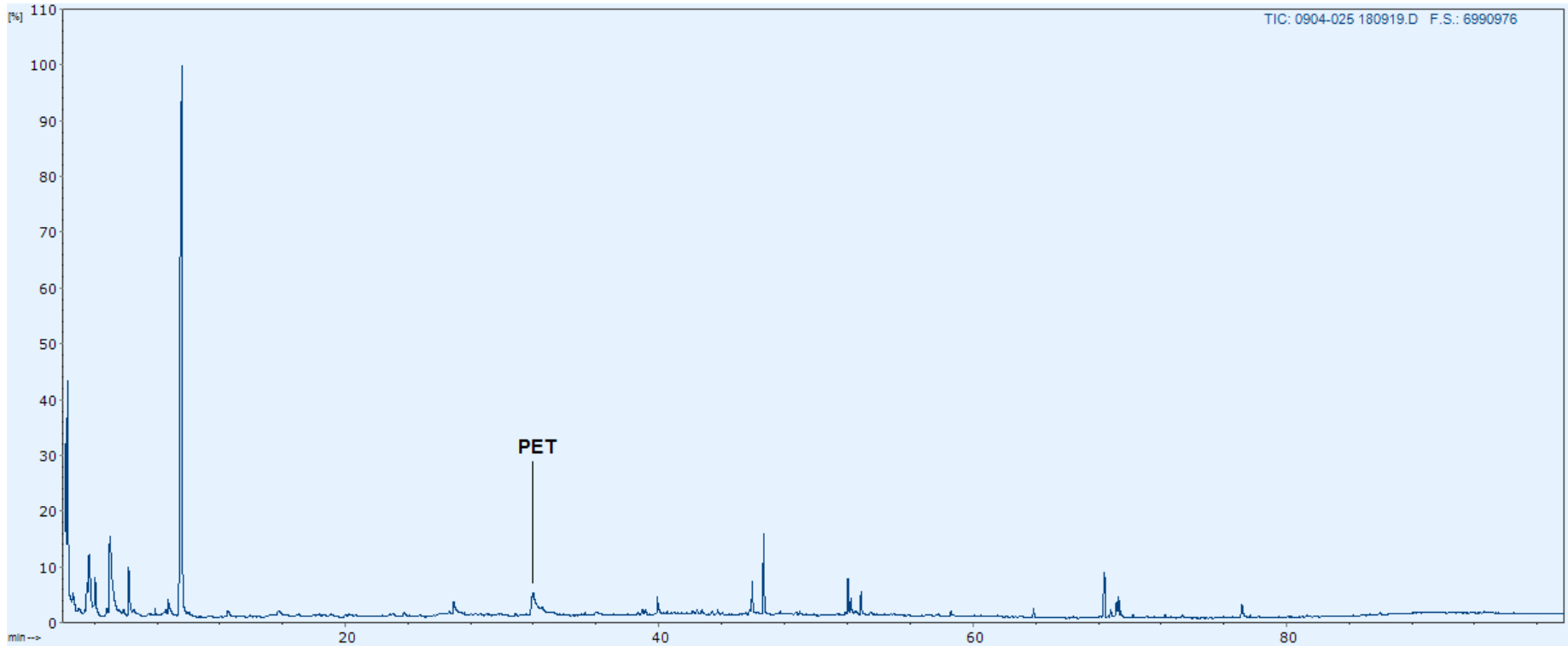


Fig. 1: Schematic view of the Py-GC/MS system (Frontier EGA Py-3030D coupled to Agilent GCMS [7890B GC & 5977A MSD])

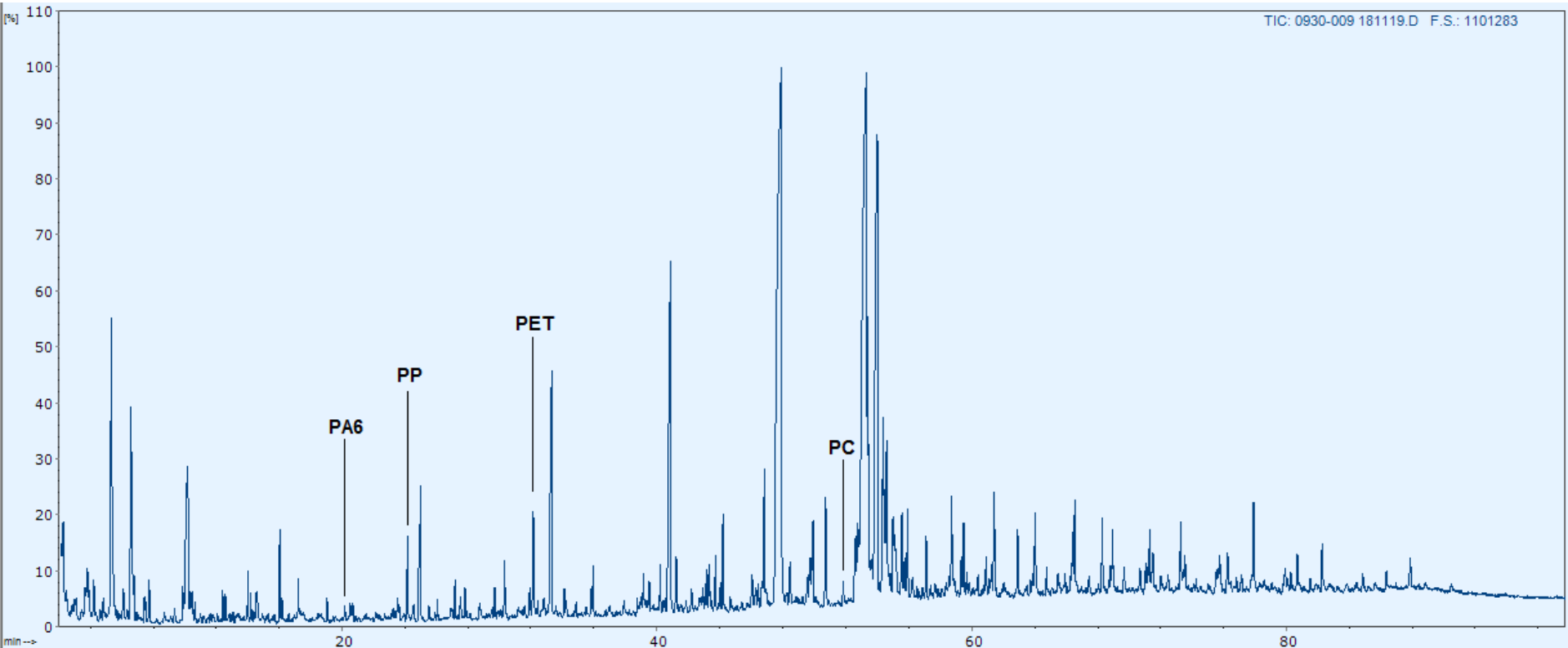




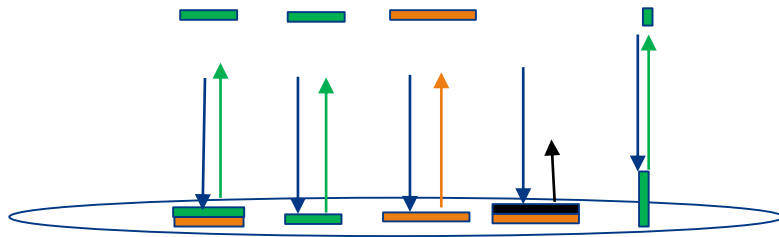
Deteksjon av fraksjoner av monomer, dimer.....







TIC av rentvannsprøve (elv)

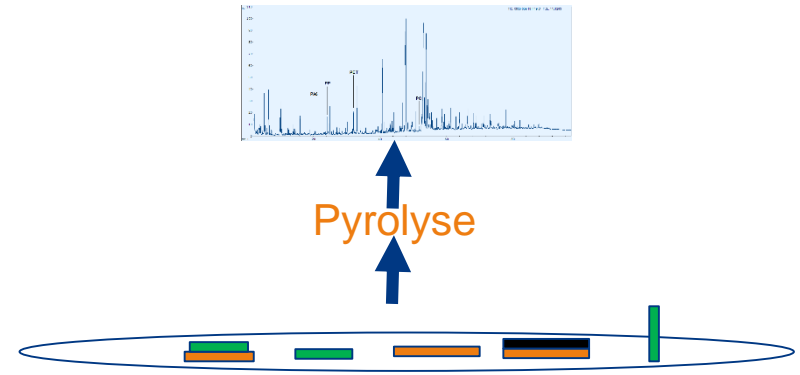




TIC av avløpsvannsprøve



FTIR : registrerer 2x 
1x 
1x 
Kanskje 1x 

Antall, Type, Form og Størrelse
Indirekte beregning av konsentrasjon
vha type (og densitet av denne) og antatt størrelse.



Pyr-GC/MS : registrerer 3x 
3x 
1x 

Bestemmer type,
Kvantifiserer masekonsentrasjon (μg)
vha standarder og kvalitetskontroll

Hovedsakelig vann av varierende renhetsgrad.

Utvikling av analyser for slam, jord og sedimenter er ferdig.

Utvikling pågår for mikroplastanalyser i biota.

Oppdager stadig nye kundebehov og prøvetyper

Får mange henvendelser om å analysere MP i diverse ting:

- Sminke
- Salt
- Teposer
- Drikkevarer (melk, øl, cider, brus)
- Fiskeolje
- Tannkrem
- Bildekk og granulater
- Vegmerking
- Shampoo
- Glitter
- Albumin
- Kjøttkaker

Bestemmelse av plasttype og kvantifisering med Pyr-GC/MS:

PE, PP, PS, PVC, PET, PC, PMMA, PA6,

polyisoprene (NR indikator) og polybutadiene (SBR & BR indikator)

Individuell kvantifisering LOQ = 0,1 - 1µg/L

Total sum av 8 polymere (5000 µm < strl > 42µm, 27µm eller 0,2µm)

Kommentar ved deteksjon av andre polymere

Ordrekoder for rent vann:

MX130, MX131 (MP), MX136 (Gummi), Begge: PMX70

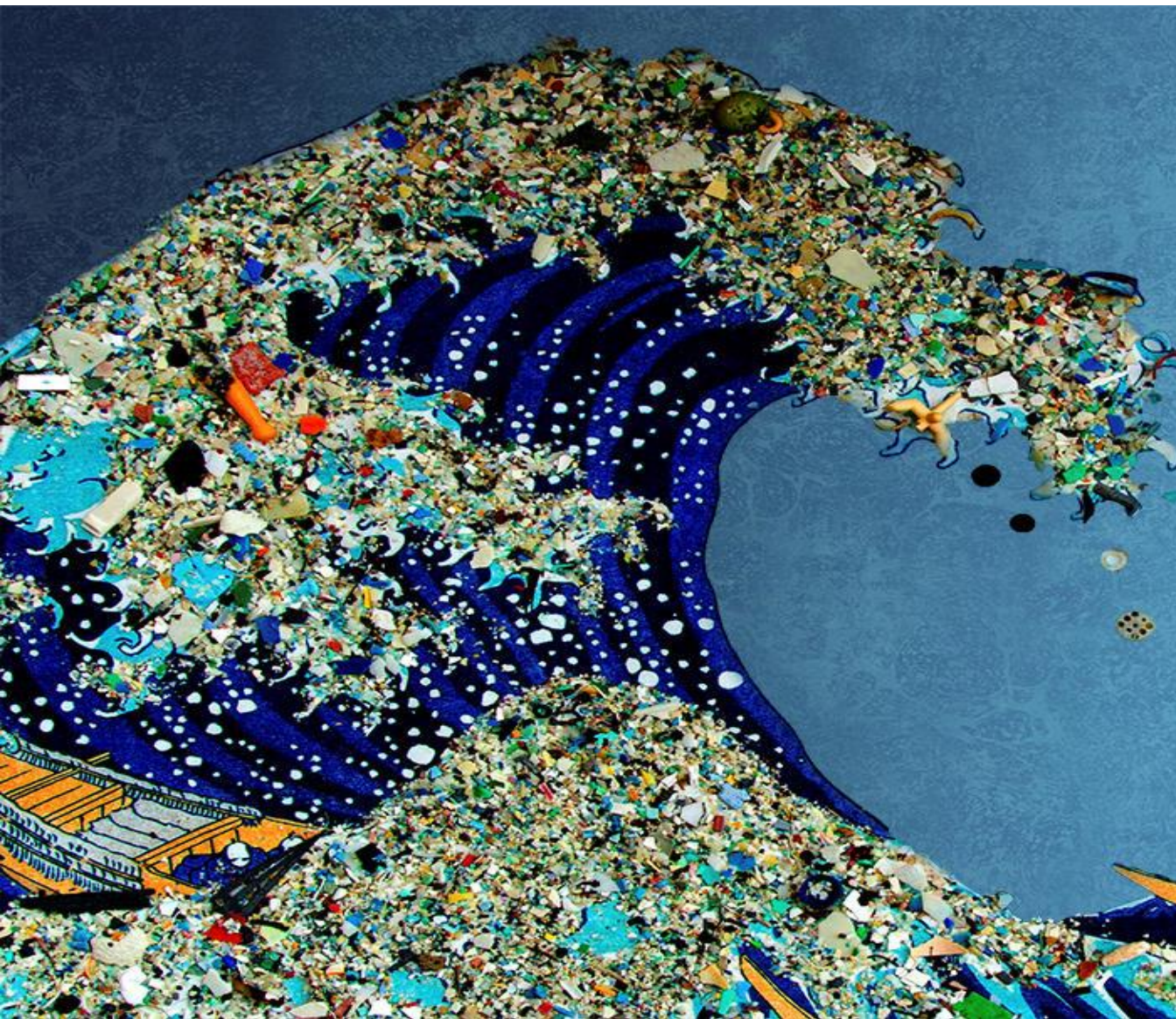
Leveringstid: 14 dager (Hasteprøver: 2 dager)

Ordrekoder for avløpsvann:

MX141 (MP), MX146 (Gummi), Begge: PMX72

Leveringstid: 21 dager (Hasteprøver: 5 dager)

Takk for oppmerksomheten!



Spørsmål?

Bergen
@eurofins.no

www.eurofins.no

Pyrolyse-GC/MS

- + Ingen krav til partikkelstørrelse, poreåpning på filter bestemmer.
- + Kan bestemme massekonsentrasjon av individuelle polymere.
(Konverterbart til fremtidige grenseverdier ved regulasjoner)
- + Deteksjon av gummi fra bildekk og andre vanskelige blandinger.
- Mengden av hver polymer må være større enn 0,1-1 µg

FTIR og/eller Raman

- + Partikkelform, –fordeling og –antall kan evalueres.
- Partikkelstørrelse må vanligvis være større enn 10µm

FTIR er ikke-destruktivt og muliggjør en kombinasjon mellom FTIR OG Pyr-GCMS ved samme prøveopparbeiding.

FTIR og Pyr-GC/MS kan kombineres

Method

Sample preparation

Instrument

Analytical run

FTIR

Sample prep and Filtration

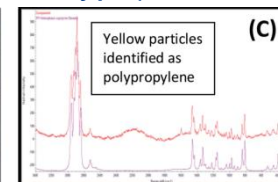
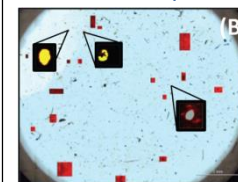
Filter



FTIR



Quantitative
(#, Size, Type)



Particle size >10 μm

Method

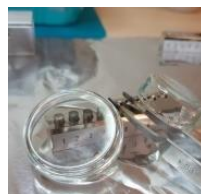
FTIR filter quantitative introduced
in Pyr-GC-MS cup

Instrument

Analytical run

Pyr-GC-MS

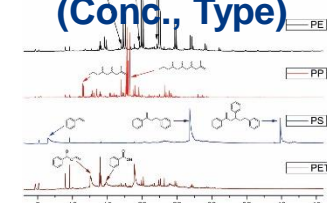
Pyr-Cup



Pyrolytic GC-MS



Quantitative
(Conc., Type)



Particle size >0.2 μm