Interreg Danube Region

Co-funded by the European Union

DANURELY -WS

Vúvh Výskumný ústav vodného hospodárstva

Interreg Danube Region
Co-funded by the European Union
AQUATIC PLASTIC

Microplastic pollution in rivers

WATER QUALITY

DANURELY WS project

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Water research institute in Bratislava, Slovakia

Webinar, 2 April 2025
10.00 – 11.00 AM

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What are microplastic ?

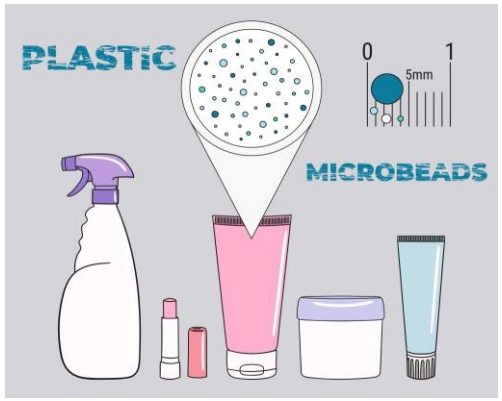
Small particles size 500 to 1 micron
Not soluble in water
Different density depends of material
Primary and secondary

Tires 28 %

Industry

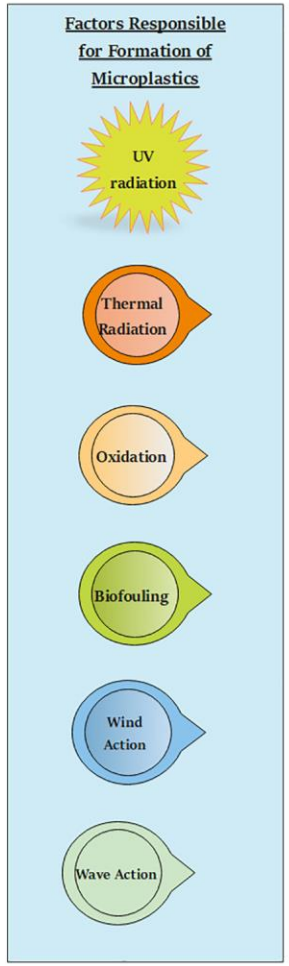
Clothes

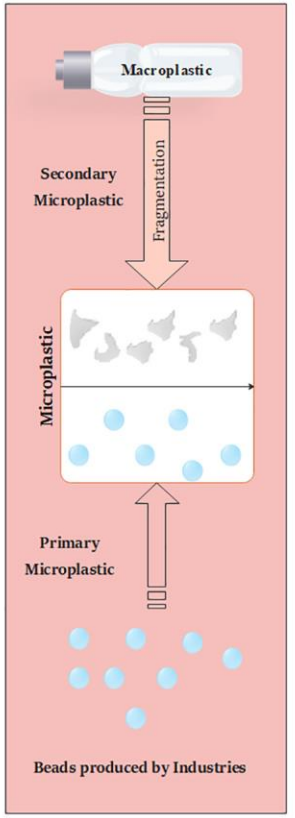
Laundry



Cosmetic

Dump site(Danube)

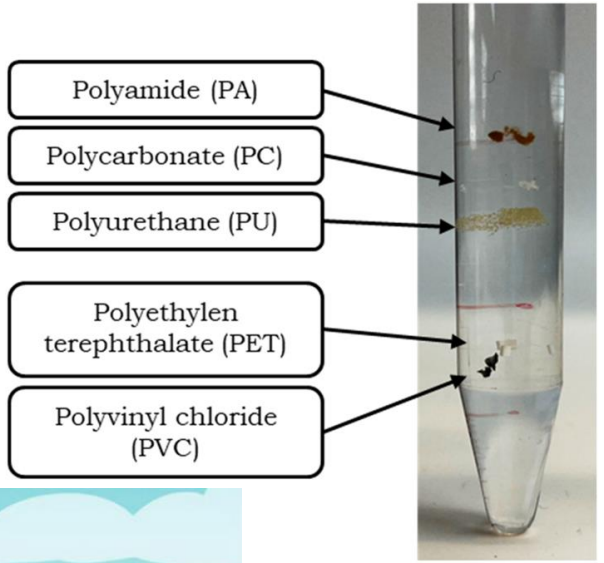


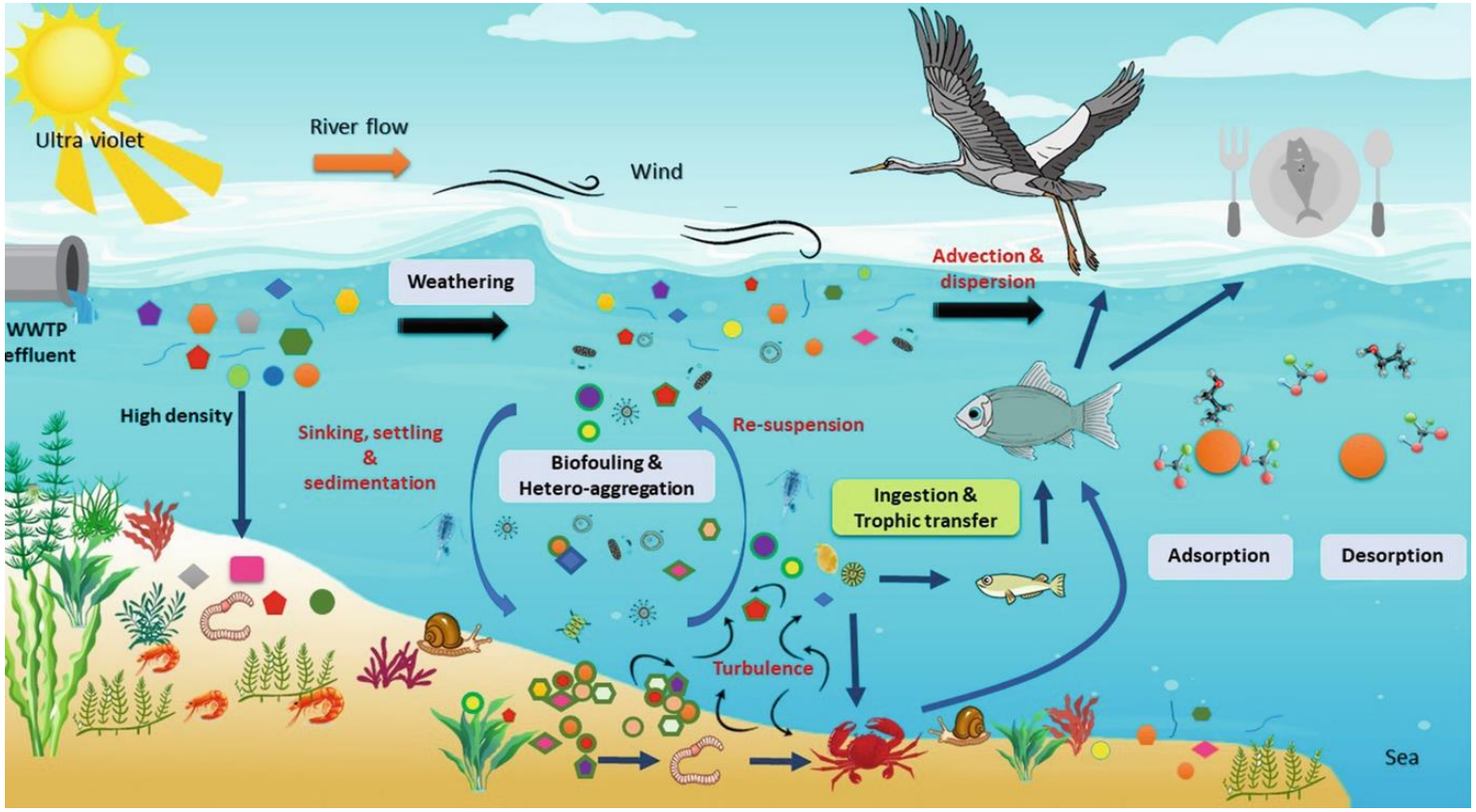


Plastic degradation

Different density depends on used polymer

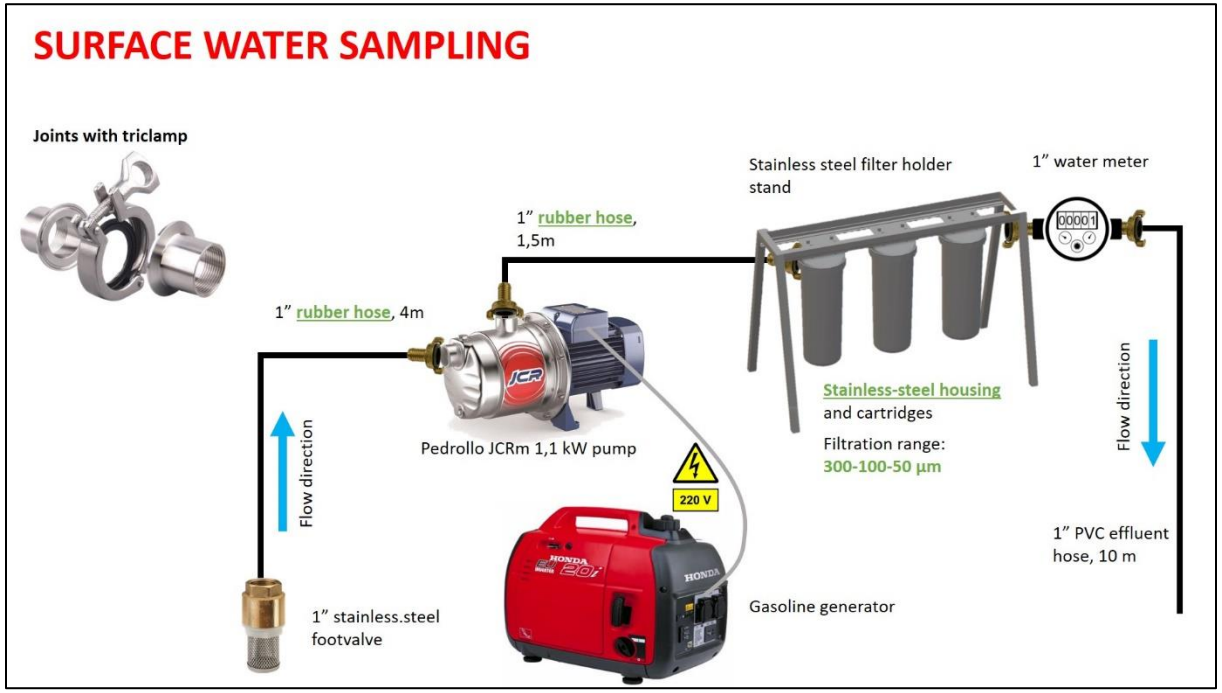
Polymer	Density low - high range (g/cm³)
Polypropylene (PP)	0.90 - 0.91
Polyethylene (PE)	0.965 - 0.97
Styrene butadiene rubber	0.98
Polyamide (PA, nylon)	1.02 - 1.05
Polystyrene (PS)	1.04 - 1.10
Acrylic	1.09 - 1.20
Polyvinyl chloride (PVC)	1.16 - 1.58
Polymethacrylate (PMA)	1.17 - 1.20
Polyurethane (PU)	1.20
Polyester (PES)	1.23 - 2.30
Polyethylene terephthalate (PET)	1.37 - 1.45





Water
Pump Sampling

-stainless steel filters
-for smaller microplastic particles
-mesh size 300,100 and 50-10 microns
-plastic free pump



Stainless steel filter

Glass jars for transfer

Other sampling methods

Plankton net

Sediment

Sedimentation box

Biota samples

Manta net

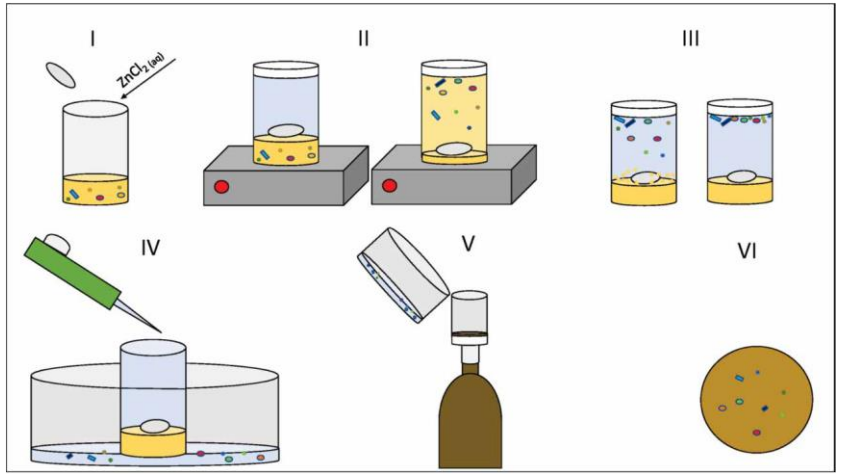
Mussel

Fish

Sample preparation

1. Filtration
2. Fenton oxidation (H_2O_2, $FeSO_4$, 3,4-dihydroxybenzoic acid)
3. Filtration
4. Density separation using $ZnCl_2$
5. Filtration and analysis

Density separation and filtration

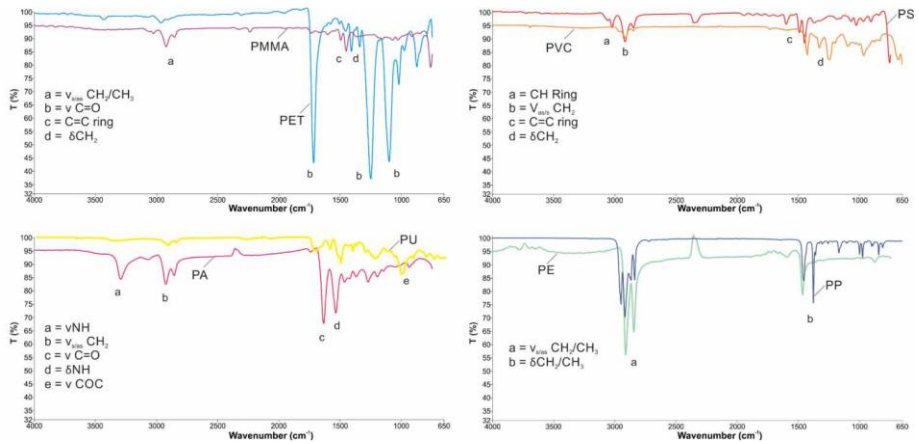


Fenton oxidation

Laminar fume hood – against contamination

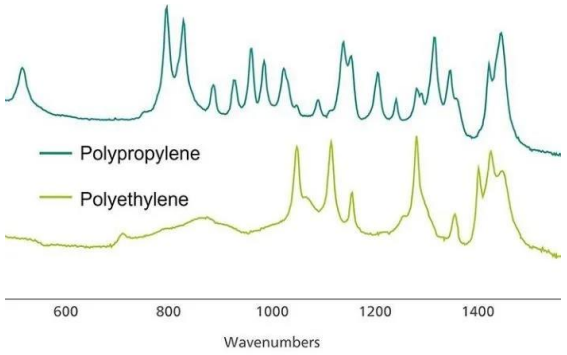
Quality analysis

Infrared spectroscopy



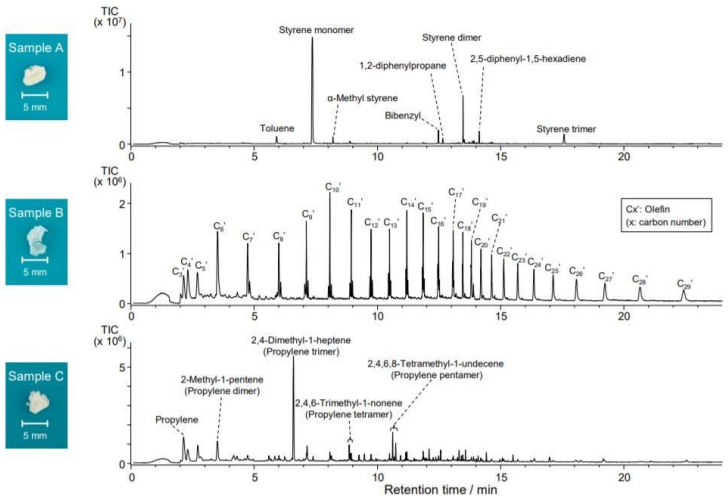
Infrared spectrum

Raman spectroscopy



Raman spectrum

ICP-MS

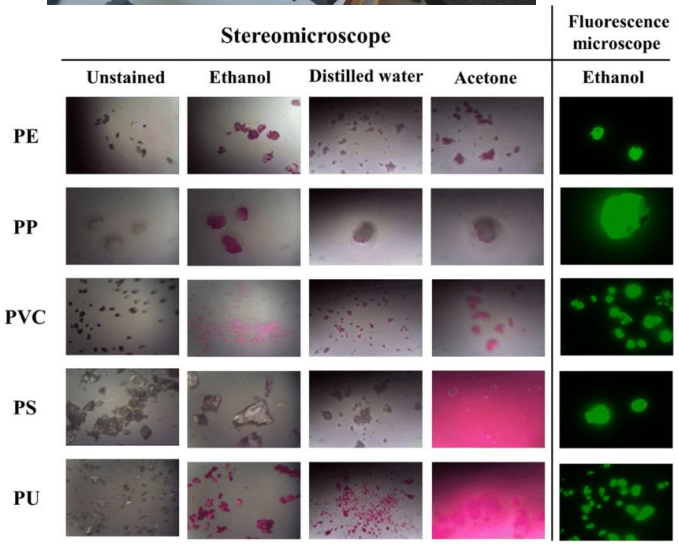


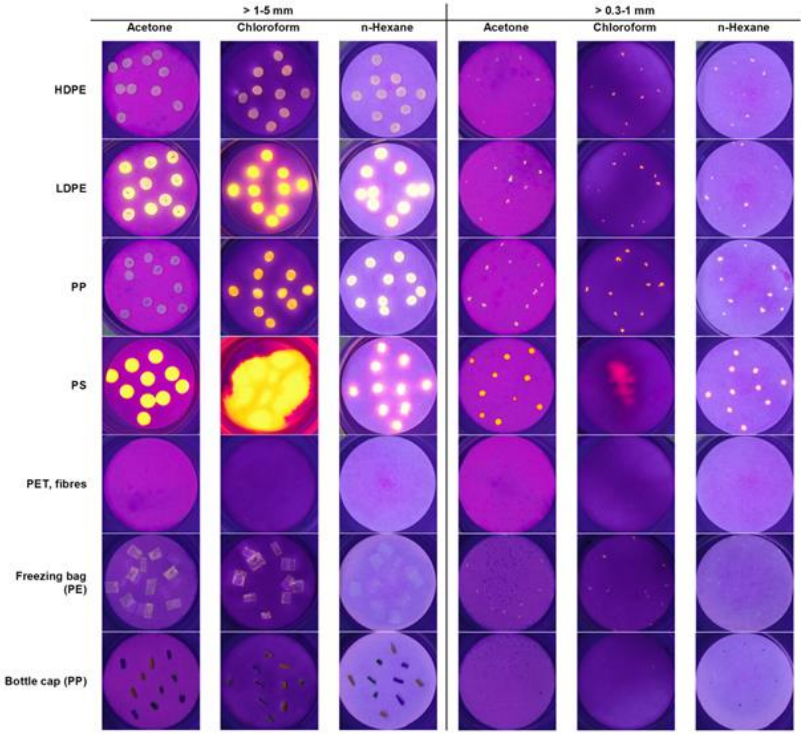
GC-MS spectrum

Gas chromatography MS

Quantity and shape

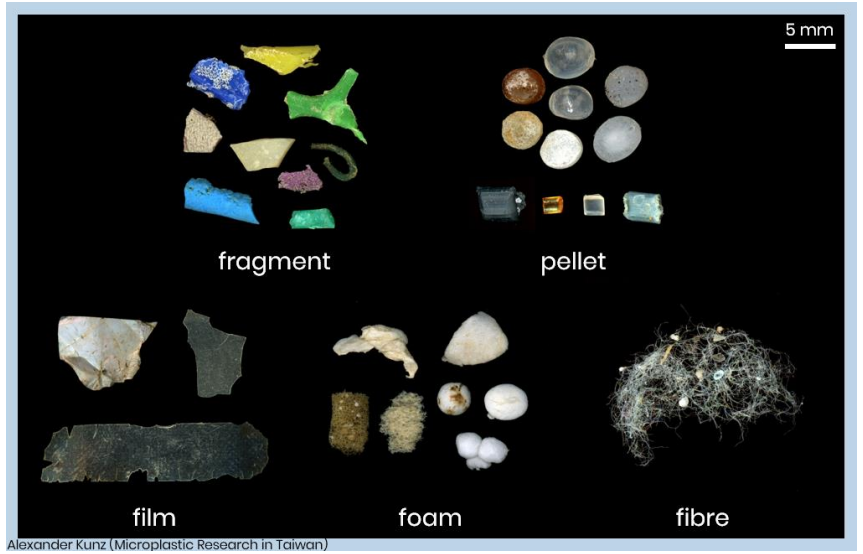
Special software on microscope counting plastic particles
Staining with Nile Red, Bengal Rose, Fluorescein etc.





Nile red dye in different solvents

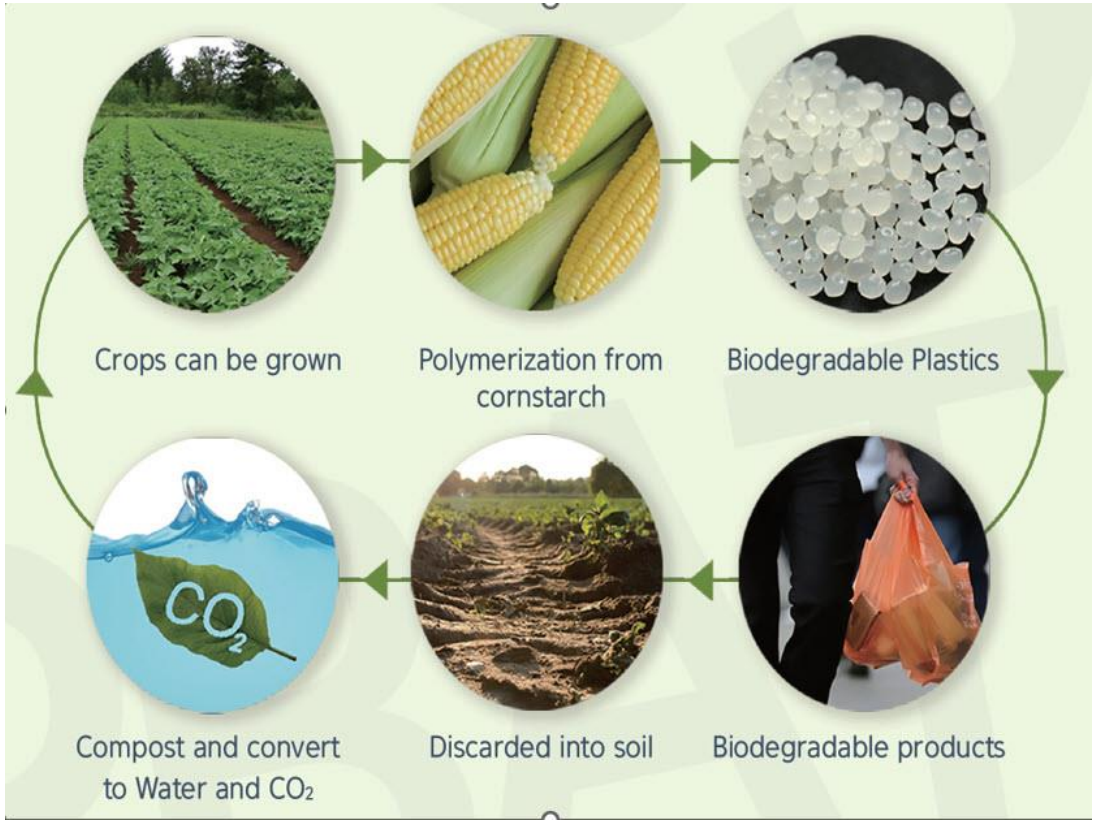
Shape	Most common polymers
Granular	PE
Fiber	PES, PET, PA
Film	PP, PE, PA
Fragments	PP, PE, PET
Foam	PU, PVC, PS



Alexander Kunz (Microplastic Research in Taiwan)

Future

-In 2050 plastic production will be 3 times more like today
- More plastic than fish in oceans
- Bioplastics – made off polysaccharide (starch, cellulose, chitosan alginate etc., proteins (soy proting, gluten, gelatin)



Thank you for your attention!