KICK-OFF MEETING, 22.5.2025.

Exposure, biological effects and fate of microplastics in aquatic organisms under different anthropogenic impacts

PlastOrgAnoTox

Microplastics analyses in calcified structures of mussels

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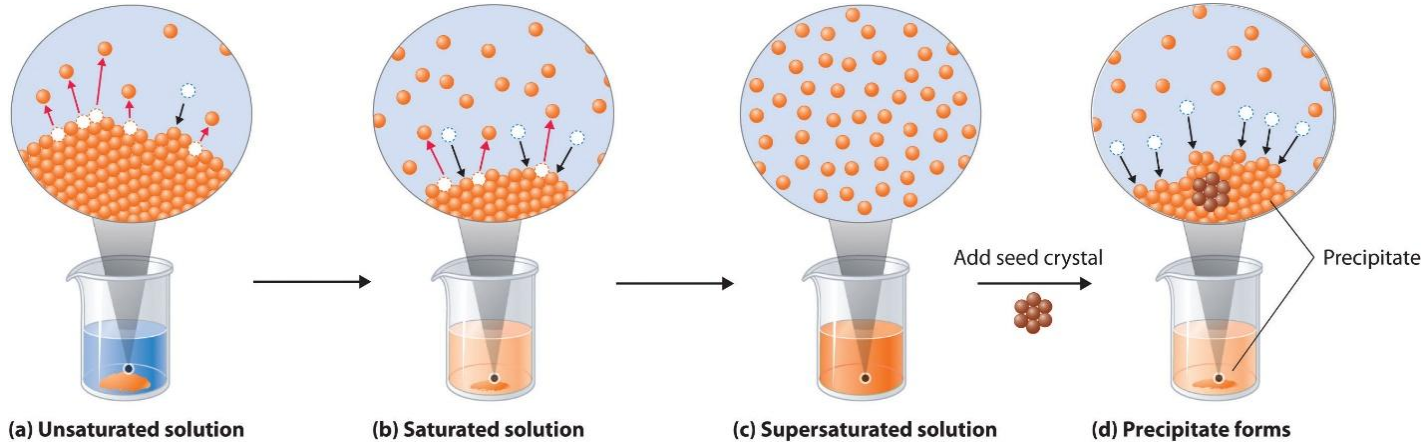
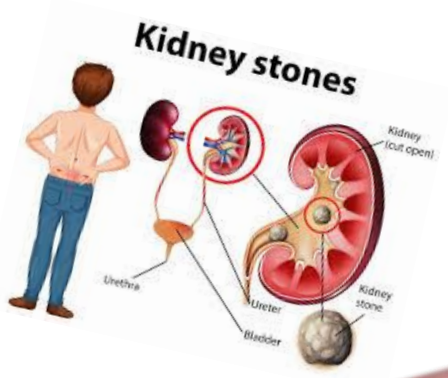
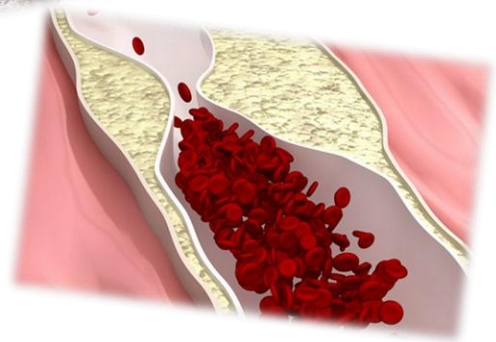
Fundamental study of precipitation processes of sparingly soluble biocompatible ionic salts ($CaCO_3$, CaC_2O_4, Ca- and Mg-phosphates…)
Interaction with: - organic molecules
- macromolecules
- microplastics



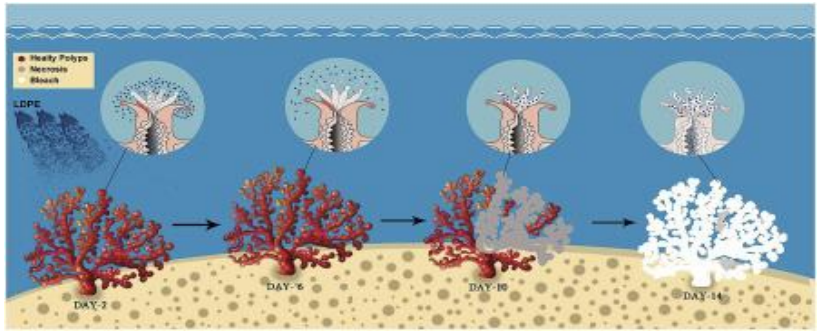




Microplastics in aquatic organisms

Microplastics in soft tissues

- MP accumulation in the intestines, stomach and gills, disruption of intestinal function and metabolism, tissue necrosis and death–endangered biodiversity



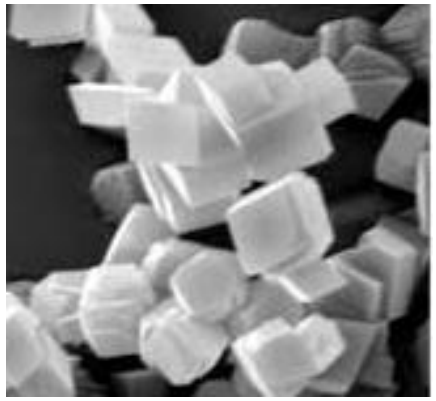
Microplastics in hard tissues

- latest researches from 2021. →
- MP is incorporated into hard tissues (shells of mollusks and bivalves and the skeleton of corals)

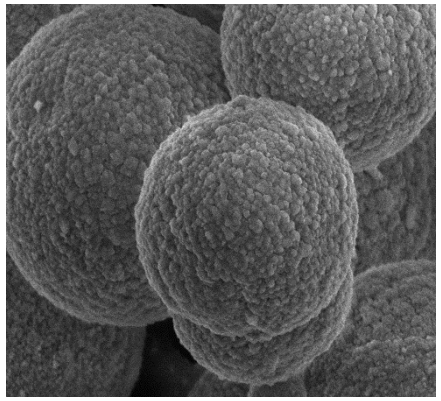
!! Inspiration for our research !!

Microplastics in hard tissues (skeleton and shell)

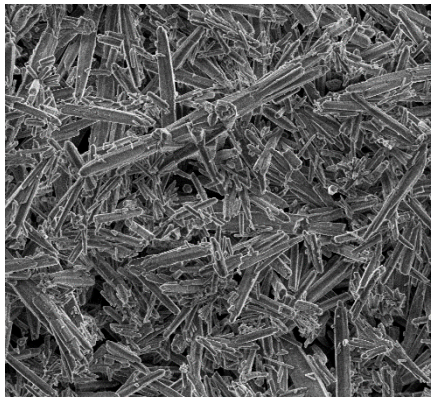
- the skeleton and shell of many aquatic organisms are made of calcium carbonate ($CaCO_3$)
- $CaCO_3$ is formed by the process of biomineralization, which is based on precipitation processes



calcite



vaterite

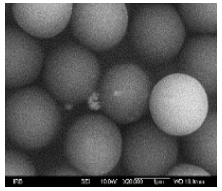


aragonite

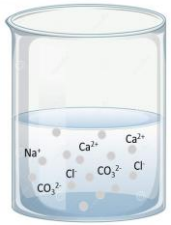
Laboratory $CaCO_3$ precipitation study - metodology

OBJECTIVE:

to investigate the incorporation of microplastics into calcium carbonate in precipitation systems of varying chemical complexity

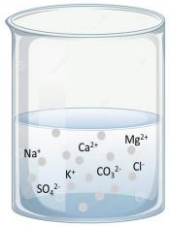


microplastics of well-defined composition, shape and size



Simply system

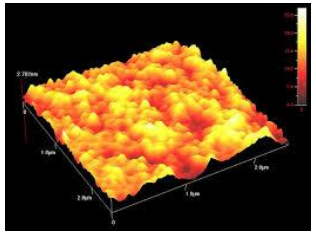
PRECIPITATION

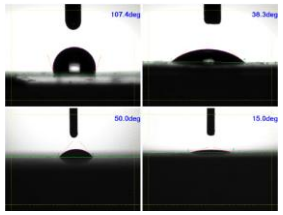


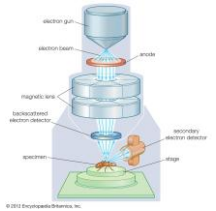
Artificial seawater (ASW)

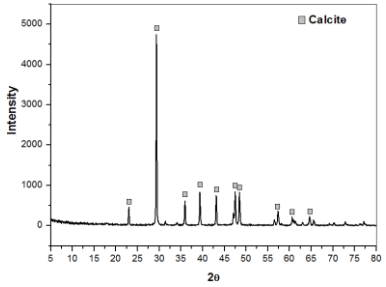
$CaCO_3$

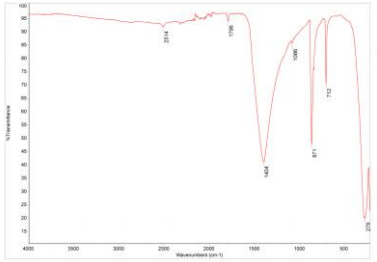
Characterization

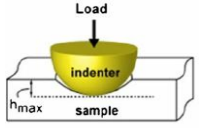


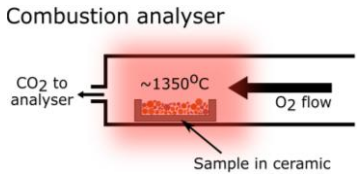








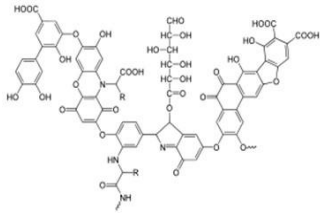


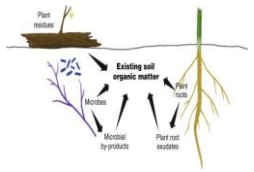


in natural waters
unavoidable interactions of HA with MP

Microplastics properties

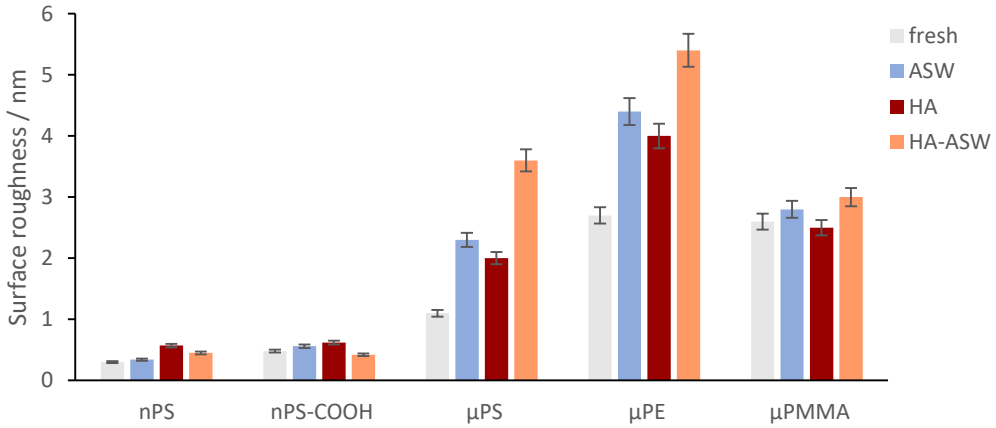
HA = humic acid
(active component
of dissolved
organic matter)

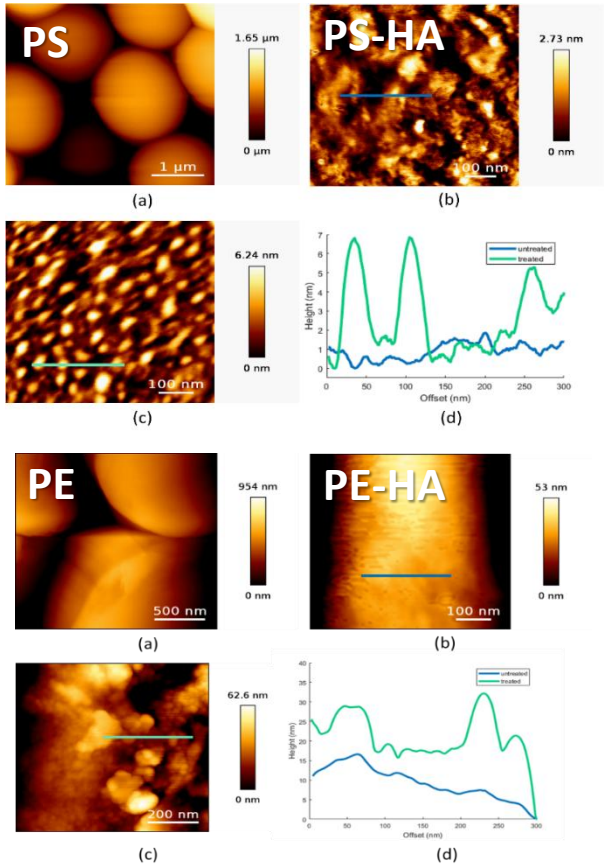




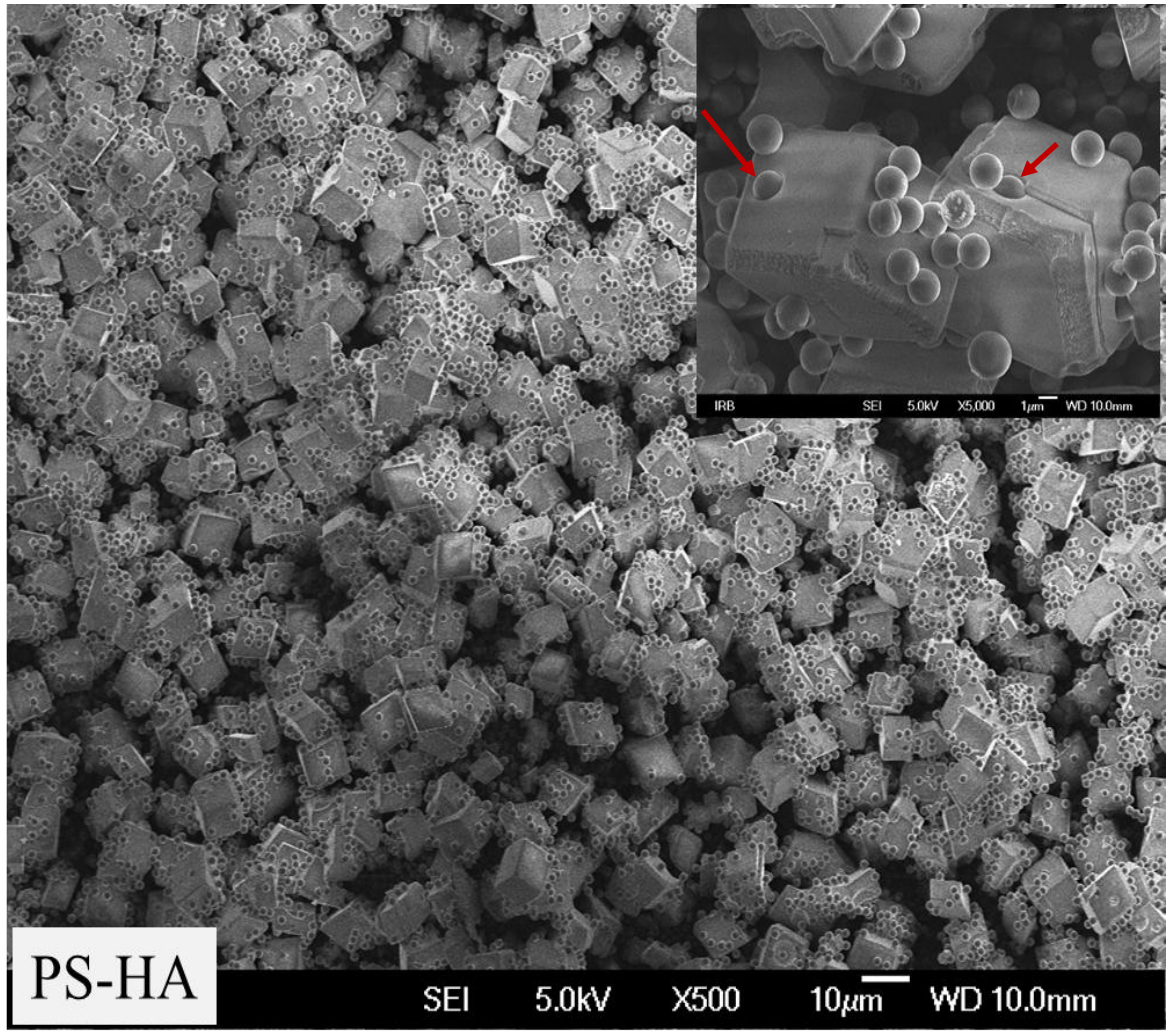
Decomposition of
organic matter

	fresh	ASW	HA	HA-ASW
nPS				
µPS				
nPS-COOH				
µPE				
µPMMA				

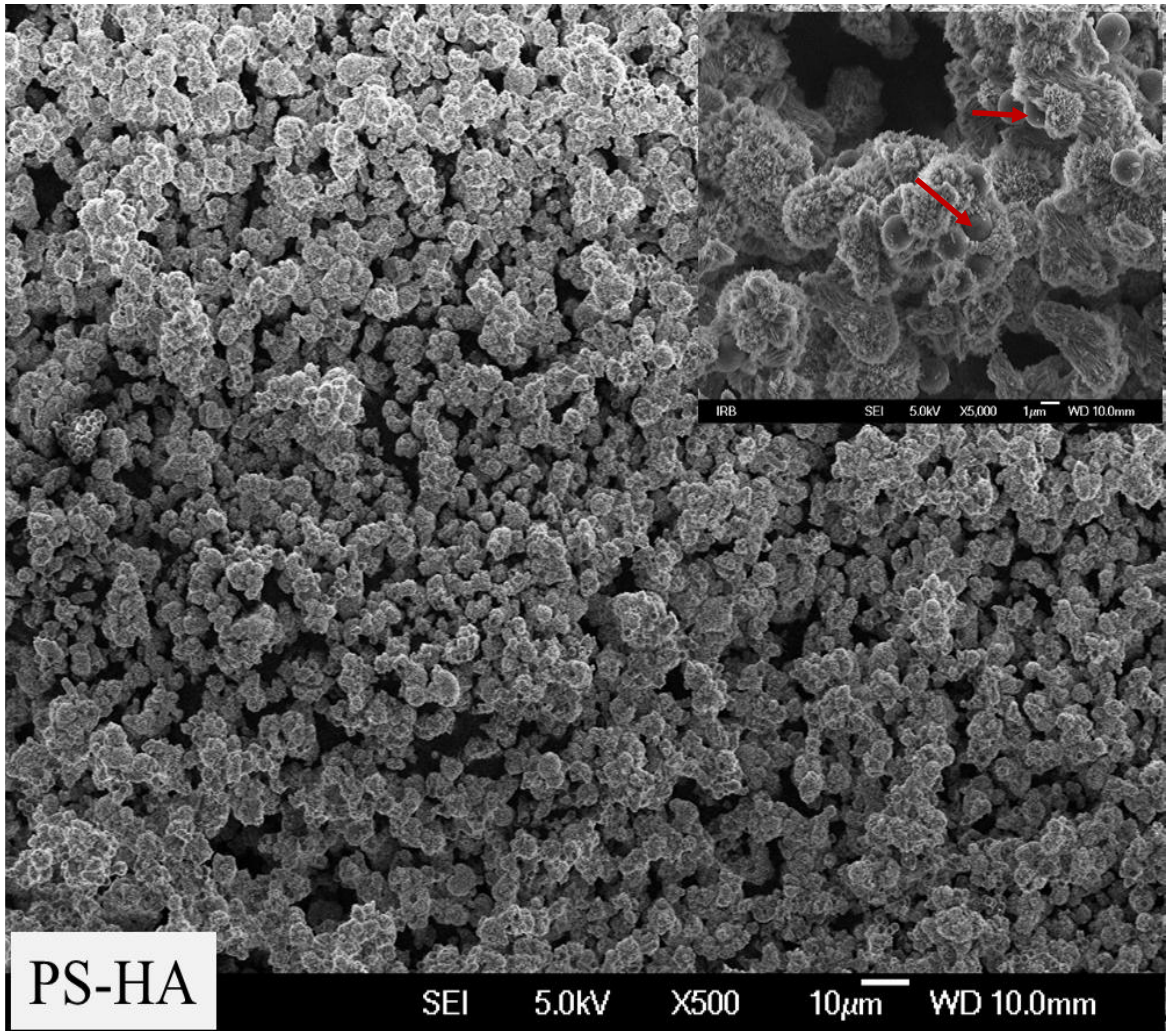




Microplastics incorporation in $CaCO_3$



calcite



aragonite

Efficiency of microplastics incorporation into $CaCO_3$

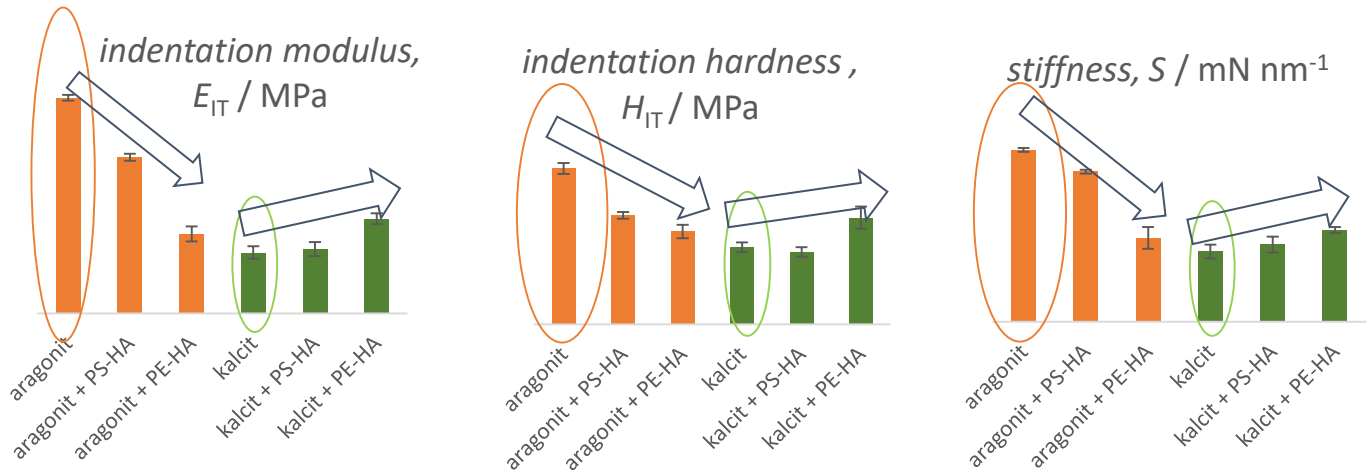
In calcite: w_{tot} / % = *m* (incorporated MP) / *m* ($CaCO_3$) = **0,09 – 0,5 %**
w_{tot} / % = *m* (incorporated MP) / *m* (initial MP) = **1,5 - 7 %**

In aragonite: w_{tot} / % = *m* (incorporated MP) / *m* ($CaCO_3$) = **0,2 – 1 %**
w_{tot} / % = *m* (incorporated MP) / *m* (initial MP) = **7 - 30 %**

Influence of microplastics on $CaCO_3$ mechanical properties

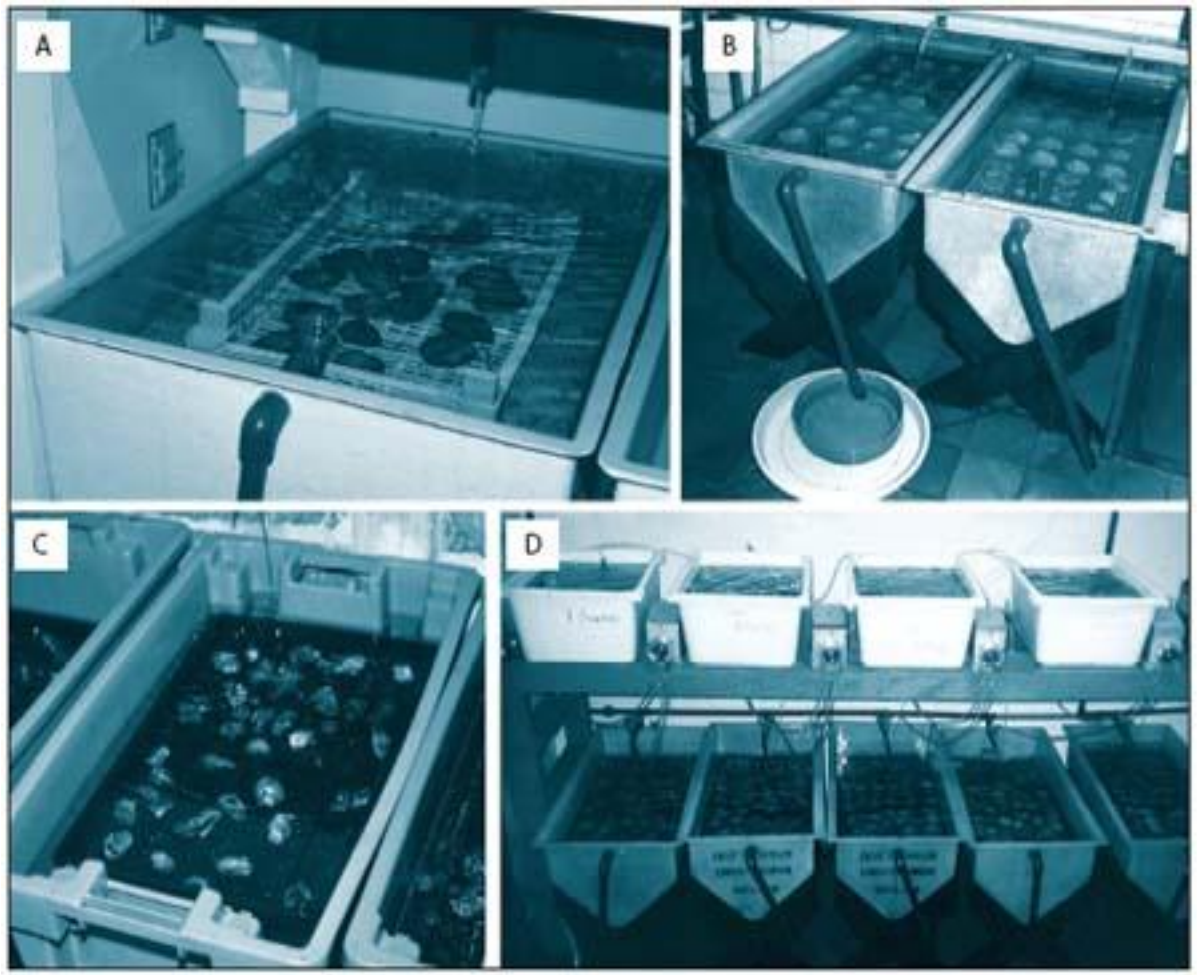
ARAGONITE

CALCITE



PlastOrgAnoTox project - continuing research with mussel shells grown in aquariums

- cultivation of mussels in an aquarium in the presence of microplastics (fluorescent polystyrene beads 1 μm)
- protocols testing and defining methodology of microplastics isolation from shells
- effect of microplastics incorporation in shells



<u>Goal:</u>

- the insights into microplastics incorporation efficiency into mussel shells and impact on their properties

WE ARE LOOKING FORWARD TO
A PLEASANT AND PRODUCTIVE COLLABORATION
WITH ACHIEVING SOME GOOD RESULTS

THANK YOU
FOR YOUR
ATTENTION