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Adsorption processes for an improvement of the quality of sea water in aquaculture

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ADAQUA: <https://archimer.ifremer.fr/doc/00416/52765/>

In shellfish hatcheries, adequate water quality is essential for the different life stages of the oyster *Crassostrea gigas*, from fertilization to spat fixation. Despite the treatments implemented upstream of the various establishments in the area of Bouin, France (fine filtration and disinfection by ultra-violet radiation), the failure to reach the D larval stage in the oyster hatcheries has been regularly observed sometimes simultaneously in several establishments. This reflects a punctual deterioration of the water quality. This context motivated the ADAQUA project which aimed at studying the process of adsorption on granular activated carbon (GAC) for an improvement of seawater quality in shellfish hatcheries, positioned upstream of the farms in order to protect them from any chemical contamination.

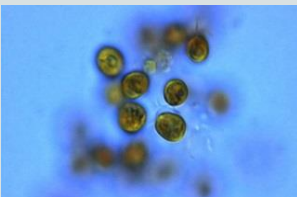
Objectives:

Determine the impact of adsorption treatment on granular activated carbon

✓ Physicochemical and microbiological quality of water

✓ Adsorption performances for targeted molecules

✓ Fertilizations and monitor larval rearing with both types of water



Partners



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Laboratory scale adsorption isotherm experiments

CCOC(=O)N(C)C1=CC=C(C)C=C1
Metolachlor

CCN1C=NC(=N1)C
Simazine

OC(=O)CNCOP(=O)(O)O
Glyphosate

Laboratory batch reactors

Derivatization method for glyphosate analysis

Maximal adsorption capacities

Metolachlor
 $q_m = 187 \pm 20 \text{ mg/g}$

Simazine
 $q_m = 338 \pm 38 \text{ mg/g}$

High efficiency on the removal of metolachlor and simazine

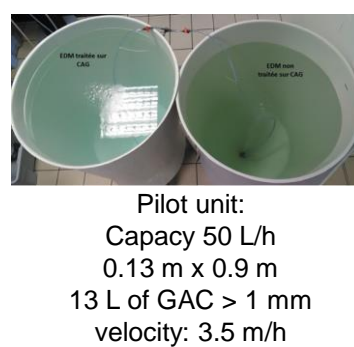
CECARBON GAC 1240 L

Not efficient on glyphosate

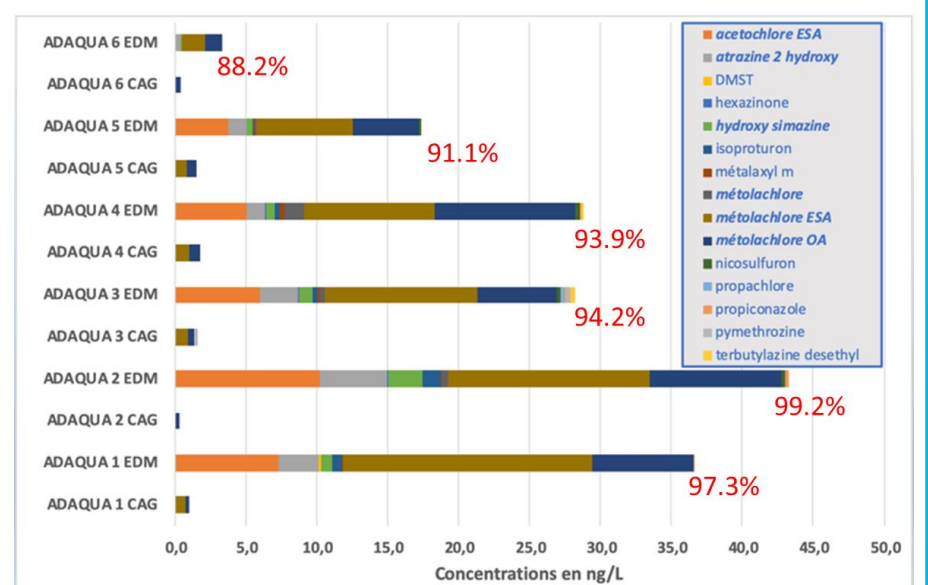
 $q_m = 0.73 \pm 0.14 \text{ mg/g}$

Performance of activated carbon column unit at Ifremer experimental platform

Process performance > 90 % on the main targeted pesticides and pharmaceutical residues in sea water



Pilot unit:
Capacity 50 L/h
0.13 m x 0.9 m
13 L of GAC > 1 mm
velocity: 3.5 m/h



Perspectives

- ✓ Optimization of the process to increase kinetics of adsorption
- ✓ Study of additional adsorbents targeting glyphosate retention