

Biosensors for the detection and monitoring of *Alexandrium minutum* along the French coasts.

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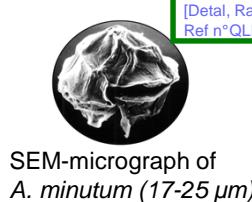
Introduction

The microalgae *Alexandrium minutum* produces neurotoxins responsible for paralytic shellfish poisoning, which upon accumulation in shellfish represent a human health risk. This species recurrently forms toxic blooms in the Northern part of the French Brittany coast. At present, algae identification relies on tedious microscope observations mostly performed by skilled taxonomists in laboratories. Newly emerging fields of molecular taxonomy, nanoscale technology and biotechnology offer opportunities for the development of **in-situ** biosensors for the detection and the monitoring of toxic algae.



REPHY monitoring network along the French coasts
Maximum of *Alexandrium* cells/l between 1999-2001
<http://www.ifremer.fr/envlit/surveillance/rephy.htm>

Strategy



SEM-micrograph of *A. minutum* (17-25 µm)



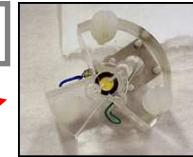
Light micrograph of *A. minutum*

Monoclonal antibody specific to *Alexandrium* species: Hybridoma 12a10 from Arago laboratory
[Détail, Rapid detection of toxic algae, Ref n°QLRT-1999-30778]

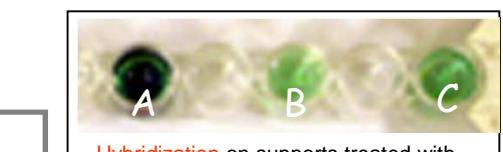
Transducers: Au, Pt, stainless steels quartz

Cell surface monoclonal antibody or
Nucleic acid probe

Gravimetric or electrical or optical transducer



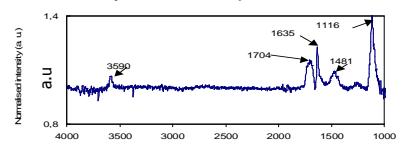
Biotinylated polypyrrole modified quartz-crystal microbalance
S. Cosnier, H. Perrot et R. Wessel, (2001)
Electroanalysis, 13, 11 971.



Hybridization on supports treated with avidin, revelation by a green coloured reaction of the ABTS substrate
A : Positive reference,
B : Functionalized Pt surface
C : Functionalized Au surface

The characterization of the biomolecules immobilisation is extremely significant to improve the stability and the response of the biosensor

Nature of the molecular groups and their orientation from FT-IRRAS



FT-IRRAS spectrum on functionalized surfaces: a/ Au, b/ Pt

Conclusions

Due to the complexity and to the interdisciplinary nature of such a development, this research requires a collaboration between fields of material science, marine chemistry, microbiology, biochemistry, biology and marine technology. The final goal will be the development of an *in situ* instrumentation for rapid, sensitive and selective *in situ* detection of toxic blooms in the frame of coastal waters monitoring.

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