

PhD course:

## SYLLABUS

### 1 Lecturer information

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### 2 Title of the course:

Miniaturized diagnostics developments for health and environment

### 3 Course program

(150-200 words)

The courses will present some investigations in the domain of diagnostic developments for health and environment in microfluidic formats. Final opening conference on the link between chemistry and the ecological transition.

### 4 Course content detailed per lesson of two hours (possibly with dates and room real and virtual)

The courses will be a mix between seminars presenting some developments in the domain of diagnostics, and an active work on related articles in group, so as to produce a 5 minutes speech for each group at in the last lesson session.

Lesson 1 – New affinity ligands and functional nanomaterials in analytical chemistry and molecular diagnostics

Lesson 2 – Miniaturized electrokinetic methodologies : Designing tools and systems for biomedical diagnosis

Lesson 3 – Microchip design for health and environment

Lesson 4 – Circular economy and chemistry

## **5 Suggested reading**

L. Trapiella Alfonso, T. Pons, N. Lequeux, L. Leleu, J. Grimaldi, M. Tasso, E. Oujagir, J. Seguin, F. D'Orlyé, C. Girard, BT Doan, A. Varenne. Clickable-zwitterionic co-polymer capped- quantum dots for in vivo fluorescence tumor imaging. *ACS Appl. Mater. Interfaces* (2018) 10, 17107-17116 (DOI : 10.1021/acsami.8b04708)

J. Gouyon, F. d'Orlyé, C. Simon, S. Griveau, C. Sella, L. Thouin, F. Bedioui, A. Varenne. Reversible microfluidics device for precious metal electrodeposition and depletion yield studies. *Electrochimica acta* (2020) 352, 136474 (DOI: 10.1016/j.electacta.2020.136474-)

B. De Castro Costa, S. Griveau, F. D'Orlyé, F. Bedioui, JA Fracassi da Silva, A. Varenne. Microchip Electrophoresis and Electrochemical Detection: a Review on a Growing Synergistic Implementation. *Electrochimica Acta* (2021), 391, 138928 (DOI: 10.1016/j.electacta.2021.138928)

A. Varenne. Cooperation increases between analytical sciences and recycling. *Tracs, Trends in Analytical Chemistry* (2013) 48, 22-29 (DOI: [10.1016/j.trac.2013.04.007](https://doi.org/10.1016/j.trac.2013.04.007))

## **6 Learning Objectives**

To be able to analyze and criticize an article about miniaturized diagnostics, be able to extract important outcomes and propose innovative perspectives.

## **7 Knowledge and Skills to be acquired**

Deep understanding of the design and development of a miniaturized diagnostics, going from molecular and biological tools, to the overall analytical process. Notions on microfluidics will be also acquired.

## **8 Prerequisites**

General notions in chemistry at the master level.

## **9 Teaching Methods**

Lessons and work on article in presential

## **10 Further information**

Language: English

## **11 Type of Assessment**

The work on the article (in groups, according to the number of students) will give rise to a 5 minutes critical presentation of an article, highlighting possible innovative perspectives (during the second part of lesson 4)

## **12 Period**

8 hours lessons