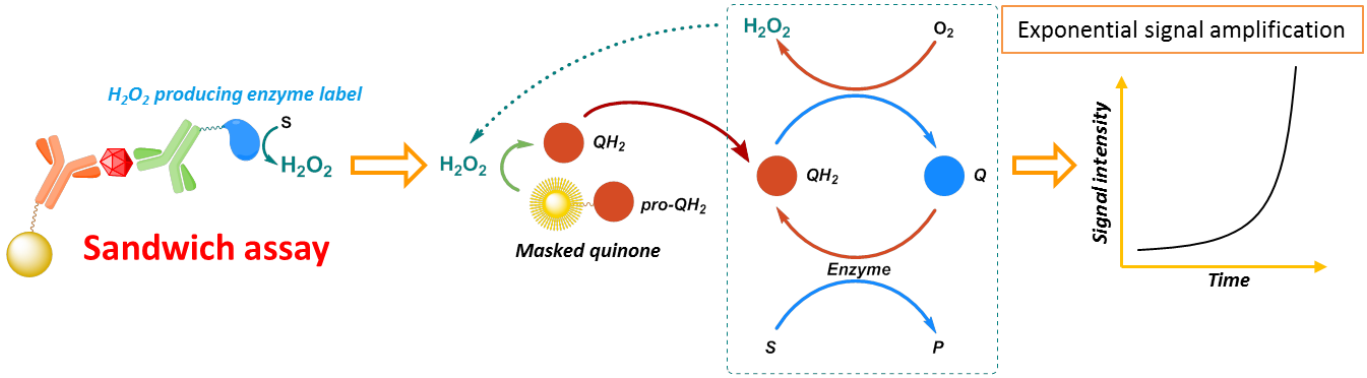
Postdoctoral Position in Organic Synthesis for Bioanalytical Applications

The main objective of the project we are developing in our team is to conceive a new generic analytical technology able to reach ultra-low detection limits of organic, inorganic or biological analytes in environmental or biological samples, with an improved simplicity and cost-efficiency. Our strategy relies on unprecedented molecular amplification rising from autocatalytic reaction networks. For that purpose, we rationally design molecular and enzymatic switches using either optical or electrochemical methods for the readout. Currently, we are validating our approach using H_2O_2-mediated reaction schemes. The key idea is to use molecular switches which, upon reaction with H_2O_2, release a redox molecule able to redox cycle in the presence of oxygen and a specific reducing enzyme. If properly designed, the system behaves autocatalytically and the analytical signal is thus exponentially amplified. This strategy will be then advantageously adapted to design ultrasensitive immunoassay with the upstream addition of H_2O_2 producing enzyme label in an affinity binding immunoassay of ELISA type (see scheme). An ideal gain of sensitivity close to 1 million over classical ELISA is projected.



Several probes based on modifications of quinones (Q) and hydroquinones (QH_2) allowed us to validate our strategy and promising detection thresholds up to 10^{-7} M in H_2O_2 have been reached.

The main objective of the postdoctoral fellow will be to design and synthesize new and robust molecular switches. She/he will be involved in the process of probes evaluation and integration in the full analytical set. Feedback from analytical results and comprehension of the reaction schemes arising from complex redox chemistry will be necessary for the design of new and original probes.
The candidate must have a strong background in organic synthesis. She/he must be interested in working at the interface between organic synthesis, analytical and bioanalytical chemistry.

Keywords: Molecular switches, Autocatalysis, Organic synthesis, Redox chemistry

DATES AND SALARY:

Available ASAP, for 1 year

~25 k€/year, funded by the ANR (ECOSENS project)

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