Università degli Studi di Padova

DiSC

Venerdì **13 Marzo 2026** alle ore **11:30** presso l'aula F

il **Prof. Giovanni VALENTI**

Department of Chemistry "Giacomo Ciamician",
Alma Mater Studiorum – University of Bologna,
email: g.valenti@unibo.it

terrà il seminario dal titolo:

Electrochemiluminescence-based biosensor: from academic curiosity to industrial success

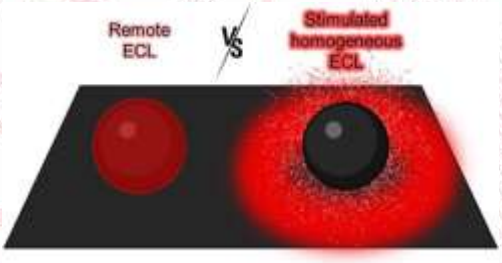
La presenza della S. V. sarà molto gradita

Sara Bonacchi

Il Direttore del Dipartimento
Stefano Mammi

ABSTRACT

Biomarkers such as proteins, hormones, or nucleic acids are biological indicators with a key role in identifying human body function variations. Being able to spot increasingly smaller quantities of these markers has become a fundamental aspect for preventive analysis of potential diseases. Thanks to its high signal-to-noise ratio ElectroChemiLuminescence (ECL) became a leading technique in their detection for the early diagnosis of diseases. [1] [2]. As a matter of fact, ECL has become a powerful analytical technique widely studied and applied both from the academic and industrial point of view. If we have a look at the last 20 years, the number of scientific publications focused on ECL research has been exponentially increased and commercial clinical analyzer, Elecsys®, is an industrial success [3]. However the sensitivity of ECL bead-based immunoassays is intrinsically limited by the reaction mechanism driving the emission of $[Ru(bpy)_3]^{2+}$ on the bead surface (Figure). In commercial ECL-based immunoassays, biomarkers are detected using sandwich immunocomplexes formed on magnetic microbeads. Beads are magnetically attracted to the working electrode surface, and the ECL signal is recorded upon application of an appropriate potential.



Despite the success of ECL in clinical analyzers, the sensitivity of bead-based ECL assays remains constrained in close proximity of electrode surface. Here, we address multiplex assays [3], investigate alternative ECL-generation mechanisms, and optimize the ECL-emitting layer. Focusing on stimuli-responsive ECL [4] and strategies such as autocatalytic schemes[5] and redox-mediator approaches[6] to expand and intensify the emitting layer for improved analytical performance.

References

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[5] Asejo MC at al Angew. Chem. Int. Ed. (2026), 65, e24093
[6] Fracassa A. at al Chem. Sci., (2024), 15, 1150–1158