Journée d'Electrochimie 2024
1er – 5 Juillet 2024
Saint-Malo, France

Electrochemiluminescence imaging of single entities: from cells to biomolecules

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ECL is the light emitted by the excited state of a luminophore upon an electrochemical reaction (i.e. without photo-excitation).[1] The initial electron-transfer reaction occurring at the electrode surface triggers a cascade of reactions involving energetic intermediates that leads to the formation of the excited state and *in fine* to the photon emission. Thus, ECL crystallizes the beauty and complexity from both electrochemistry and photochemistry. Historically, ECL has progressively evolved from a lab curiosity to a process allowing to investigate the Marcus inverted region. With the discovery of ECL emission in water, ECL has become a powerful bioanalytical technique with an extremely low background that is successfully used for the clinical diagnostics. It is successfully commercialized for the sensitive detection of various biomarkers (antibodies, hormones, viral proteins, tumor markers, *etc.*) in human body fluids.

In the last decade, ECL has evolved further from an analytical method to a powerful microscopy method.[2,3] Various configurations have been developed by playing with the light and the dark in order to see conductive or non-conductive objects, with or without a labeling step. In a first part, the development of coreactant-based ECL as a surface-confined microscopy to image single cells and their membrane proteins down to the single molecule level will be discussed.[4-7] In a second part, new ECL approaches such as photo-induced ECL based on illuminated semi-conductors will be presented to extend the performances of ECL imaging and photo-addressable systems.[8-10]

References

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