Electrochemiluminescence detection and imaging of single entities: from biomolecules to cells

Neso Sojic

[a] *Univ. Bordeaux, CNRS, Bordeaux INP, ISM, UMR 5255, 33607 Pessac, France*
sojic@u-bordeaux.fr

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 powerful bioanalytical technique with an extremely low background that is successfully used for the clinical diagnostics.

In the last decade, ECL has evolved further to a powerful microscopy method.[2] 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 molecular aspects of the ECL process will be discussed with the development of ultrasensitive ECL detection in bioassays.[3-4] In a second part, new ECL approaches such as surface-confined microscopy[5-6] and photo-induced ECL based on illuminated semi-conductors[7-8] will be presented to extend the performances of ECL imaging and photo-addressable systems.

References

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