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EDITORIAL

Analytical electrochemiluminescence

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Electrochemiluminescence (also called electrogenerated chemiluminescence and abbreviated as ECL) is a chemiluminescence process resulting from an electrochemical reaction. The introduction of electrochemical reactions, together with the facile tunability of potentials, currents, reaction time, reaction position, and electrode size, makes ECL highly versatile. Coreactant ECL dominates in analytical ECL because there are numerous ECL coreactants and it is much easier to generate ECL in environmentally benign and user-friendly aqueous solutions through a coreactant pathway. ECL has two main analytical applications. On the one hand, it has been used for the detection of coreactants, ECL enhancers, and ECL quenchers. On the other hand, it has been used for the detection of compounds through coupling with molecular recognition materials, such as antibodies, DNA, and aptamers. For the former applications, great advances have been made in the construction of regenerable luminophore-modified electrodes, the development of new luminophores and catalyst, and the simultaneous detection of multiple analytes by coupling with separation techniques, including HPLC, capillary electrophoresis, and microchip (e.g., polydimethylsiloxane (PDMS) or paper-based microchips). For the last application, significant progress has been made to develop new ECL luminophores (e.g., iridium complexes and semiconductor nanocrystals), new coreactants, and new signal amplification strategies (e.g., nanomaterial-based and/or enzymatic signal amplification strategies) to enhance sensitivity and multiplex analysis techniques using electrode arrays, bipolar electrodes, and luminophores with different emission wavelengths as well as explore the applications of ECL for scientific research. Additionally, various new devices and detectors, such as smartphone-based ECL detectors and wireless ECL devices, have appeared recently. The recent publication of the first comprehensive ECL monograph, the success of the First International Conference on Electrogenerated Chemiluminescence (ECL 2014) in Bertinoro and the Second International Meeting on Electrogenerated Chemiluminescence (ECL 2016) in Bordeaux, as well as this first topical collection on ECL demonstrate great interest in the subject.

This first topical collection on ECL includes three excellent critical reviews and about twenty high-quality original research papers. The three critical reviews cover recent advances and their future perspectives in bipolar ECL, cyclometalated iridium(III) chelate ECL, and ECL food analysis. The research papers demonstrate new results in

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luminophores, coreactants, biosensors, functional electrodes (e.g., boron-doped diamond nanoelectrodes or electrodes modified with carbon nanotubes, graphene, graphitic carbon nitride, ceria nanoparticle-reduced graphene oxide nanocomposites, or dendrimers), microscopic imaging and tuning, molecular logic gates, microfluidic device, and miniaturized analytical instrumentation. These articles are of great value for future study.

Potential future developments of ECL may include new materials (luminophores, coreactants, and electrocatalysts), high-throughput analysis techniques, bipolar electrochemistry, wireless systems, point-of-care testing microchips, portable instruments, single-cell detection, single-molecule detection, label-free detection, new analytical strategies, and new applications of ECL as well as computational approaches.

We are very grateful to all authors for the submission of their valuable manuscripts for this topical collection. We would like to thank the reviewers for their constructive and insightful comments and the editorial team of *Analytical Bioanalytical Chemistry* for their professional support and cooperation. We hope that this topical collection will benefit the ECL society and promote the development of ECL.

Hua Cui is a Full Professor of Analytical Chemistry at the University of Science and Technology of China. She is also an editor of Analytical and Bioanalytical Chemistry. Her current research interests include nano-chemiluminescence and nano-electrochemiluminescence and their applications in interdisciplinary fields, including public health, food safety, and environmental monitoring.

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