NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Physical and Mathematical Sciences
College of Science

CBC SEMINAR ANNOUNCEMENT

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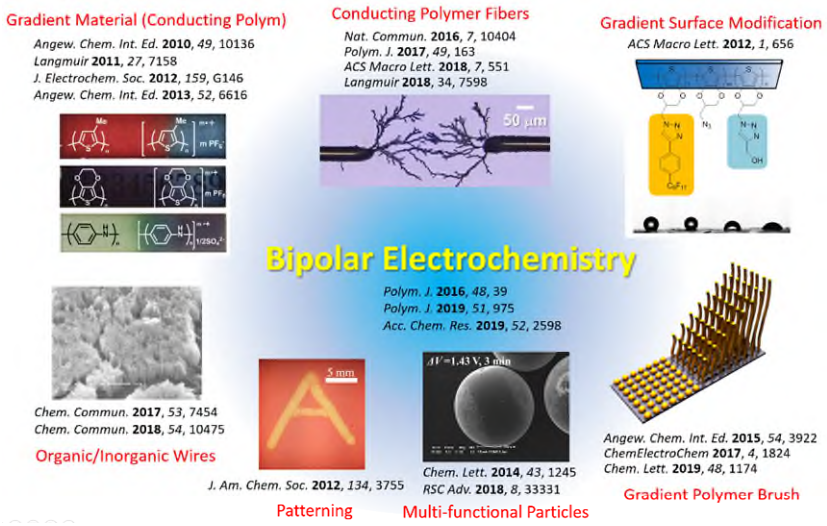
Biopolar Electrochemistry: A Powerful Tool for Fabrication of Functional Materials

Electrosynthesis is a powerful method for the synthesis of organic, inorganic and polymeric materials based on electron transfer-driven reactions at the substrate/electrode interface.[1] The use of electricity for synthetic reactions without the need for hazardous chemical oxidants and reductants is recognized as a green and sustainable method. Other advantages include control of the reaction selectivity by tuning the electrode potentials. A different mode for driving electrochemical reactions has recently been proposed, in which bipolar electrodes (BPEs) are available as wireless electrodes that undergo anodic and cathodic reactions simultaneously. Bipolar electrochemistry is an old technology that has recently garnered renewed attention due to the interesting features of BPEs because (i) the wireless nature of a BPE is useful for sensors and material synthesis, (ii) the gradient potential distribution on BPEs is a powerful tool for the preparation of gradient surfaces and materials, and (iii) electrophoresis is available for effective electrolysis.

Recent progress in bipolar electrochemistry for the electrosynthesis of functional materials is summarized.[2] The wireless nature of BPEs was utilized for symmetry-breaking to produce anisotropic materials based on the site-selective modification of conductive objects by electrodeposition and electropolymerization. Potential gradients on a BPE interface have been successfully used as controllable templates to form molecular or polymeric gradient materials, which are potentially applicable for high throughput analytical equipment or as biomimetic materials. The electric field necessary to drive BPEs is also potentially useful to induce the directed migration of charged species. The synergetic effects of electrophoresis and electrolysis were also successfully demonstrated to obtain various functional materials. These features of bipolar electrochemistry and the various combinations of techniques have the potential to change the methodologies of material synthesis.



References

1. T. Fuchigami, M. Atobe, S. Inagi, *Fundamentals and Applications of Organic Electrochemistry: Synthesis, Materials, Devices*, Wiley, **2014**.
2. N. Shida, Y. Zhou, S. Inagi, *Acc. Chem. Res.* **2019**, *52*, 2598.

Date: 10th December 2019 (Tuesday)
Time: 11.00am to 12.30pm
Venue: SPMS Research & Graduate Studies Conference Room
Host: Assistant Professor Soo Han Sen