

University of Louisville
Department of Chemistry

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Literature Seminar

When: October 8, 2020

Time: 2:30 PM

Location: Microsoft TEAMS

A Pipette-Based Imaging Technique Using Scanning Electrochemical Cell Microscope

Abstract

Nano electrochemistry is a growing branch of electrochemistry with wide range of applications such as electrocatalysis, electrochemical imaging, chemical sensing and even in energy storage devices. Further deepening into the atomic level studies would give the accessibility to visualize and quantify the underlying important processes in the macroscopic level.¹ Since small entities are directly affected by the electron transfer reactions, the use of electrochemical measurements would be appropriate. Electrochemical scanning tunneling microscope (EC-STM) and electrochemical atomic force microscope (EC-AFM), two classes of electrochemical scanning probe microscopes (EC-SPM) are used for localized imaging with global electrochemical response.² Scanning electrochemical microscope (SECM) is one of the EC-SPMs which enable to get the localized imaging and electrochemical response. It is a pipette-based technique that comprises of two working electrodes, one for the pipette and another for the substrate of interest and allows highly resolved electrochemical responses due to its localized behavior.³ A drawback to SECM is that the entire electrode (substrate of interest) should be placed in a solution for the measurements. Therefore, there is a necessity of development of a technique which can form more localized electrochemical response. Scanning electrochemical cell microscope (SECCM) provides local current by making the solution very local where only a small region is in the solution.⁴ Versatility of SECCM provides its importance in the present electrochemical studies.

Reference:

1. Mirkin, M. V.; Sun, T.; Yu, Y.; Zhou, M. Electrochemistry at one particle. *Acc. Chem. Res.* **2016**, 49, 2328–2335
2. Bentley, C. L.; Edmondson, J.; Meloni, G. N.; Perry, D.; Shkirskiy, V.; Unwin, P. R. Nanoscale Electrochemical Mapping. *Anal. Chem.* **2019**, 91, 84–108
3. Polcari, D.; Dauphin-Ducharme, P.; Mauzeroll, J. Scanning Electrochemical Microscopy: A Comprehensive Review of Experimental Parameters from 1989 to 2015. *Chem. Rev.* **2016**, 116, 13234–13278
4. Ebejer, N.; Schnippering, M.; Colburn, A. W.; Edwards, M. A.; Unwin, P. R. Localized High-Resolution Electrochemistry and Multifunctional Imaging: Scanning Electrochemical Cell Microscopy. *Anal. Chem.* **2010**, 82, 9141-9145