Biomaterial Surfaces & Interfaces
Room Naupaka Salon 5 - Session BI2-TuM

Biomaterials/Interfaces - Biosensing
Moderator: Volker Nock, University of Cantebury

10:20am **BI2-TuM-8 Mechanochromic Polymer, Polydiacetylene, for Force-, Bio-Sensing Applications**, ***Kaori Sugihara,*** Institute of Industrial Science, the University of Tokyo, Japan **INVITED**

The forces around us, such as grip forces, loads on buildings and machines, and friction, are closely related to our health and safety. While technologies exist to measure such forces, there are still many types of forces that cannot be measured with existing technologies, such as molecular forces at nanoscale or the detection of curved or anisotropic forces. Mechanochromic materials are expected to play a pivotal role in these niches. In my talk, I will introduce the mechanism and applications of a mechanochromic lipid polymer called polydiacetylene towards biosensing.[1-2]

References

1. Juhasz, L.; Ortuso, R. D.; Sugihara, K., Quantitative and Anisotropic Mechanochromism of Polydiacetylene at Nanoscale. *Nano Lett* **2021,** *21* (1), 543-549.
1. Chen, J. L.; Zheng, J. L.; Hou, Y. G.; Sugihara, K., Colorimetric response in polydiacetylene at the single domain level using hyperspectral microscopy. *Chem Commun* **2023,** *59* (25), 3743-3746.

11:00am **BI2-TuM-10 Inspired by Nature: Next-Gen Multiplex Biosensing with Biomimetic Surfaces**, ***Saimon Moraes Silva,*** 1/6 Patterson Street, Bonbeach, Australia **INVITED**

A major issue faced by electrochemical surfaces that need to function in biological fluids remains the biofouling of electrode surfaces. In this presentation, I will demonstrate how lubricin (LUB) can mitigate the biofouling issue and enable the development of biosensors that function in unprocessed whole blood. LUB is a cytoprotective glycoprotein present in synovial fluids and coating cartilage surfaces in articular joints.[1] It displays a distinguishing chemistry, conformational and molecular structure, and also the ability to self-assemble in a well-organized manner on substrates of different materials.[2,3] When attached to a conductive surface, LUB presents the capability of preventing biofouling and at the same time allowing good electrochemistry with the advantage of a simple and one-step coating preparation.[4] This makes LUB an interesting surface coating for applications such as bionic implants and electrochemical biosensors. In this presentation, I highlight both recent technological advances associated with the LUB coatings for use in electroactive surfaces and a number of recent advances toward point-of-care diagnostics enabled by this unique biomimetic surface coating.

References

[1] S. M. Silva, A. F. Quigley, R. M. I. Kapsa, G. W. Greene, S. E. Moulton, Chemelectrochem 2019, 6, 1939-1943.

[2] M. Y. Han, S. M. Silva, W. W. Lei, A. Quigley, R. M. I. Kapsa, S. E. Moulton, G. W. Greene, Langmuir 2019, 35, 15834-15848.

[3] Silva, S. M.; Langley, D.; Cossins, L.; Samudra, A.; Quigley, A. F.; Kapsa, R. M. I.; Tothill, R. W.; Greene, G. W.; Moulton, S. E. ACS Sensors 2022, 7, 3379–3388.

[4] M. J. Russo, M. Y. Han, A. F. Quigley, R. M. I. Kapsa, S. E. Moulton, E. Doeven, R. Guijt, S. M. Silva, G. W. Greene, Electrochimica Acta 2020, 333.

11:40am **BI2-TuM-12 Polyaniline-Gold Nanocomposite as an Electrode Material for Supercapacitor and Escherichia Coli Detection**, ***Md Zaved Hossain Khan,*** Jashore University of Science and Technology, Bangladesh

The present work is focused on detection and quantification of low-density E. Coli using a new supercapacitor-based biosensor. Herein, gold nanoparticles (AuNPs) doped pseudo capacitive PANI-PS composite has been synthesized by in situ oxidative deposition of PANI-ES in the presence of AuNPs in aqueous H2SO4. The novel nanocomposite AuNPs@PANI-PS exhibits excellent supercapacitor performance and bio-electrochemical sensing of E. Coli, which is only possible for chronoamperometry deposition respective charging event on electrode surface. In addition, AuNPs@PANI-PS electrode shows high specific capacitance (812.96 F/g, with 2.5 mA/g, current density) and 207.43 Wh/kg energy density respective 6.05 KW/kg power density. In E. Coli detection, AuNPs@PANI-PS based sensor can exhibit a wide linear range of 10-108 CFU/ml with a limit of detection of 1.0 CFU/ml. Except laboratory strain, we also detect it in urine medium. The proposed whole cell biosensor provides high selectivity for the detection of E. Coli bacteria in the presence of E. Coli DH5-α, E. Coli ATCC, S. Typhi DMS_A1, P. Aeruginosa, S. Flexneri, and others. Finally, the smartphone-based application of this biosensor showed excellent performance. Therefore, the proposed composite can serve as an effective material in supercapacitor and the monitoring of E. Coli

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