SYNERGY

EXPERT TALK

FLEXIBLE PRINTED ELECTRONICS PLATFORMS FOR PHYSIOLOGICAL MONITORING

Wearable electronics can provide valuable information on physiological state, but are commonly restricted by bulky or rigid components, driving demand for more unobtrusive and conformable wearable technologies [1]. One solution to this problem is flexible sensor patches containing electrode structures fabricated by high-throughput roll-to-roll printing for enabling low unit cost and high inter-device uniformity. These sensor patches can be modified with selective chemistries for monitoring of biomarkers in sweat, such as cortisol, an indicator for mental and physical health [2]. Coupling of printed sensor patches with flexible readout electronics facilitates non-invasive and wireless physiological monitoring in real-time, with applications including lactate measurements for athletes [3]. Such monitoring platforms can be adapted for sensing of other sweat constituents and even sweat rate [4], with broad potential applications including healthcare, military and sports.

[1] L. GILLAN, J. HILTUNEN, M. H. BEHFAR, K. RÖNKÄ, JPN. J. APPL. PHYS. 2022, 61, SE0804.
[2] L. GILLAN, E. JANSSON, FLEX. PRINT. ELECTRON. 2022, 7, 025014.
[3] L. GILLAN, T. TEERINEN, M. SUHONEN, L. KIVIMÄKI, A. ALASTALO, FLEX. PRINT. ELECTRON. 2021, 6, 034003.
[4] M. BARIYA, N. DAVIS, L. GILLAN, E. JANSSON, A. KOKKONEN, C. MCCAFFREY, J. HILTUNEN, A. JAVEY, ACS SENSORS 2022, 7, 1156.

SEPTEMBER 29TH, 2022 | 13H45
UNINOVA AUDITORIUM

LIAM GILLAN

RESEARCH SCIENTIST IN THE FLEXIBLE SENSORS AND DEVICES TEAM
VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD

SYNERGY

EXPERT TALK

A PERSPECTIVE ON VAPOUR PHASE METHODS FOR ATOMIC SCALE PROCESSING

This presentation will introduce the basic concepts of vapour phase growth, in particular chemical vapor deposition (CVD) and atomic layer deposition (ALD), as scalable growth processes that can achieve demanding technology requirements. The mechanisms of growth, doping strategies and how the advantages and disadvantages of these methods can be exploited are examined in terms of the miniaturization of electronic devices. To illustrate these points, two material classes studied at Tyndall, metal oxides and 2D materials are discussed, both in terms of what has been achieved and where improvement is needed to further realise the potential.

IAN POVEY

PRINCIPAL RESEARCHER AND THE HEAD OF THE ADVANCED MATERIALS AND SURFACES GROUP

TYNDALL NATIONAL INSTITUTE, UNIVERSITY COLLEGE CORK, IRELAND

SEPTEMBER 29TH, 2022 | 14H30
UNINOVA AUDITORIUM

ORGANIC MATERIALS SUPPORTING THE LITHIUM AND POST-LITHIUM ENERGY TECHNOLOGIES

Europe needs to emerge as a global leader in the field of batteries by accelerating the development of underlying strategic technologies and, in parallel, building a European battery cell manufacturing industry based on clean energy and circular economy. Europe has the potential to take the lead if we combine our strengths, create a more coordinated and truly collaborative approach that unites industry, researchers, policymakers and the public.1

With the aim of inventing ultra-high-performance batteries being safe, affordable, sustainable and with a long lifetime, organic chemistry emerges as a key field to design new materials aiming at targeting battery gigafactories requirements.

In this contribution the main activities carried out at the Electrochemistry Group of the Politecnico di Torino in collaboration with international organic chemistry groups will be presented, with a special focus on:

- Polymer electrolytes able to ensure safety and self-repairing ability to lithium batteries;2
- Recovery of cardanol- and lignin-based biomasses to produce post-lithium batteries, e.g. potassim-based.3

This contribution also aims to start new collaborations within the SYNERGY consortium and with the Portuguese scientific community dealing with sustainable materials development for energy devices.

[1] BATTERY 2030+, LINK: BATTERY2030.EU.
[2] F. ELIZALDE, J. AMICI, S. TRANO, G. VOZZOLO, R. AGUIRRESAROBE, D. VERSACI, S. BODOARDO, D. MECERREYES, H. SARDON, F. BELLA, J. MATER. CHEM. A 2022, 10, 12588 – 12596.
[3] S. TRANO, F. CORSINI, G. PASCUZZI, E. GIOVE, L. FAGIOLARI, J. AMICI, C. FRANCIA, S. TURRI, S. BODOARDO, G. GRIFFINI, F. BELLA, CHEMSUSCHEM 2022, 15, E202200294.

SEPTEMBER 29TH, 2022 | 15H30
UNINOVA AUDITORIUM

SYNERGY

EXPERT TALK

FEDERICO BELLA

FULL PROFESSOR OF CHEMISTRY, DEPARTMENT OF APPLIED SCIENCE AND TECHNOLOGY
POLITECNICO DI TORINO, ITALY

TEM ANALYSIS AND SAMPLE PREPARATION FOR BEAM-SENSITIVE MATERIALS

Transmission electron microscopy (TEM) uses the interaction between the electrons and a material to image the microstructure and to characterize crystal structure, strain, defects as well as, composition (e.g., by energy dispersive X-ray spectroscopy (EDS)) and chemical bonding (electron energy loss spectroscopy (EELS)) of the material. The resolution attainable for TEM images could be down to the atomic level. TEM enables to address many challenges in novel materials development, improving products properties and manufacturing processes, and supporting defect analysis and physical failure analysis.

As a unique technique, TEM including low-voltage TEM is used to characterize beam-sensitive materials, e.g., graphene [1] and 2D polymers [2], for future nanolectronics and flexible electronics. In particular, in-situ approaches are developed to investigate the mechanical properties and fracture mechanism of 2D polymer, to observe the degradation process of dielectrics (organo-silicate glass (OSG)) in the back-end-of-line (BEoL) structures from microchips [3], and to understand strain engineered bandgap in graphene nanoribbons. Sample preparation (e.g., transfer and patterning) for these materials are presented as well.

[1] Z. LIAO ET AL. SCI. REP. 7, (2017), 211-1-7.
[2] T. ZHANG ET AL. NAT. COMMUN. 10, (2019), 4225-1-9.
[3] Z. LIAO ET AL. MICROELECTRON. ENG. 137, (2015), 47-53

SEPTEMBER 29TH, 2022 | 16H15
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SYNERGY

EXPERT TALK

BOWEN ZHANG
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