JOINT AMRS - BITRI WEBINAR AND PANEL DISCUSSION

"Towards Sustainable Energy for African Development"

Date: 9th November 2021 / Time: 1600 - 1800

All times are in GMT +2 or South African Time Zone

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PLENARY SPEAKER

Prof. Michael Stanley Whittingham

Nobel Prize Chemistry, 2019 "For the Development of Lithium-Ion Batteries"
Director NorthEast Center for Chemical Energy Storage
Binghamton University

Prof. Mmantsae Diale

South African Research Chair (SARCHI) in clean and green energy, University of Pretoria

Prof. Chibueze Amanchukwu

Pritzker School of Molecular Engineering, University of Chicago

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PROGRAMME

Moderator: Dr Samuel Chigome, President, AfricanMRS

16:00 - 16:05	**Opening remarks:** Mr Edwin Elias, Board Chair, BITRI
16:05 - 16:50	Prof Michael Stanley Whittingham: **Lithium Batteries: From a Dream to Enabling a Clean Fossil-Free World**
16:50 - 17:10	Prof Mmantsae Diale: **Towards high-efficiency perovskite solar cells**
17:10 - 17:30	Prof Chibueze Amanchukwu: **Enabling energy-dense lithium metal batteries with novel electrolyte design**
17:30 - 17:50	Panel discussion/Q&A
17:50 - 1800	**Closing remarks:** Prof Edward Dintwa, Dean, Faculty of Engineering and Technology, University of Botswana

ABSTRACTS

Lithium Batteries: From a Dream to Enabling a Clean Fossil-Free World

Prof Michael Stanley Whittingham
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In 1972 rechargeable lithium batteries were just a dream. Now they dominate battery storage and as described by the Nobel Committee "They have laid the foundation of a wireless, fossil fuel-free society, and are of the greatest benefit to humankind". Their origins, the present status and future opportunities/ challenges for energy storage will be discussed with an emphasis on electrification of the energy supply to enable renewable energy and electric vehicles. The elimination of fossil fuels will reduce climate change and leave a cleaner world for our children and grandchildren, but we must have a sustainable supply chain.

Towards high-efficiency perovskite solar cells

Prof Mmantsae Diale
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The power conversion efficiency (PCE) of metal halide perovskite-based solar cells has reached over 25 %, passing the well-established thin film based devices. The high efficiency in combination with the low cost of materials and processes are the selling points of this cell over the commercial silicon solar cells. The characteristic features of perovskite materials may enable further advancement of the PCE beyond those afforded by the silicon solar cells, toward the Shockley–Queisser limit. This review summarizes the fundamentals behind the optoelectronic properties of perovskite materials, as well as the important approaches to fabricating high-efficiency perovskite solar cells.

Enabling energy-dense lithium metal batteries with novel electrolyte design

Prof Chibueze Amanchukwu
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Batteries with high energy densities (energy stored per mass or volume) are required to electrify transportation. Lithium metal batteries can double the energy density of current lithium-ion batteries by replacing the graphite anode with a lithium metal anode. However, lithium metal is highly reactive and continuously decomposes the electrolyte. In this work, we synthesize a series of new fluoroether electrolytes that allow us to obtain structure-property relationships and we show that the connectivity between ethers and fluorinated moieties play a significant role in modifying ionic conductivity and oxidative stability. Our work correlates fluoroether molecular structure and ion solvation properties to long term lithium metal battery cycling, and insights gained will lead to longer lasting lithium metal batteries that revolutionize electrified transport. Finally, I will discuss opportunities to lower the barrier for Africans to participate in energy-related research and contribute to solving climate change related challenges.