www.ansole.org & www.waitro.org

ANSOLE´s 14th Anniversary International Online Conference (A²IOC 2025)
&
1st WAITRO SDG7 Working Group Online Conference (WAITRO-WG7-25)
21st -22nd (Fri-Sat) February 2025

In partnership with *Riga Photonics Centre, Riga, Latvia + Institute of Polymeric Materials and Testing (IPMT), Johannes Kepler University Linz, Austria+ World Conference on Photovoltaic Energy Conversion (WCPEC-9)+ TEA@SUNRISE Network, Swansea University, Wales, UK+ Impulsouth Community of Practice*
Co-Hosted *by MaSIM, North-West University, Mahikeng, South Africa, and Multimedia University of Kenya, Nairobi, Kenya*

AI assisted Zoom meeting:
Only registered attendees would recieve the link by email

Day 1: Friday, 21. Feb. 2025

1

08.30-09:00	Entering the virtual room and networking
09:00-09:05	Welcome and organizational issues by **Prof. Daniel A.M. Egbe**, Chairperson and CEO of ANSOLE e.V.
09:05-09:10	Welcome addresses by the Cohosts **Prof. Ashmore Mawire** and **Dr. David Wafula Wekesa**, and the Secretary General of WAITRO, **Prof. Paul Burrows**
Session 1: Presentation of Institutions & Initiatives **Chairpersons: Prof. Daniel A. M. Egbe & Nnenna Veronica Ebem**	
09:10 – 09:35	***Keynote***: World Association of Industrial and Technological Research Organisations (WAITRO): Past, Present and Future *by Prof. Paul Burrows* JITRI – Jiangsu Industrial Technological Research Institute, Nanjin, China
09:35-09:50	**World Conference on Photovoltaic Energy Conversion (www.wcpec-9) in Daejon, Korea** *by Prof. Woo Kyoung Kim* School of Chemical Engineering, Yeungnam University, Yeungnam, South Korea.
09:50-10:05	Durability of hybrid laminates for renewable energy technologies (photovoltaics, wind power & electric vehicles) *by Prof. Gernot Wallner* Institute of Polymeric Materials and Testing (IPMT), Johannes Kepler University Linz, Linz, Austria
10:05-10:20	Empowering the Global South: The Impulsouth Community of Practice for a Gender-Just Energy Transition *by Mirana Andriarisoa* Fundación Avina**,** Calle Evelio Lara, Casa 131b, Ciudad del Saber, Clayton, Ciudad de Panamá, Panamá
10:20 – 10:35	Advancing the Sustainability of Perovskite Photovoltaics for Energy Access and Circular Economy *by Prof. Matthew Lloyd Davies, Dr. Mark Spratt & Prof. Trystan M. Watson* Swansea University, SPECIFIC IKC & TEA@SUNRISE, Materials Science

	and Engineering, Faculty of Science and Engineering, Swansea, UK & University of KwaZulu-Natal, School of Chemistry and Physics, Durban, South Africa
10:35-10:40	Solar Energy Research at the North-West University (NWU) *by Prof. Ashmore Mawire* MaSIM, North-West University, Mahikeng, South Africa
10:40-10:45	Identifying the best locations for solar and wind power through energy modelling *by Dr. David W. Wekesa* Multimedia University of Kenya, Nairobi, Kenya
10:45-10:50	Scientists of Kenya Association (ScoKA): Championing the Cause of Kenyan Scientists *by Catherine Nyaruai Njeri* Scientists of Kenya Association- Physical Sciences, Nairobi, Kenya
10:50-11:00	African Network for Solar Energy e.V. (ANSOLE e.V,) International & Local Affairs and Sustainability Practices *by Nnenna Veronica Ebem & Prof. Daniel A. M. Egbe* ANSOLE e.V., Wagnergasse 25, 07743 Jena, Germany
11:00-11:20	**Coffee Break**
	Session 2: General Topics 1 **Chairpersons: Prof. Ashmore Mawire & Lilies Kathami Kathumi**
11:20-11:40	Ethical Impacts and Value Conflicts around H_2 storage in Salt Caverns in The Netherlands *by Dr. Ineke Malsch* EthicSchool & Malsch TechnoValuation, Utrecht, The Netherlands
11:40-11:55	Utilizing Jordan's Wind: Innovative Ways to Achieve SDG 7 Goal and Sustainable Energy *by Omar khazaleh* Royal Scientific Society of Jordan, Amman, Jordan
11:55-12:10	Advancing Solar Energy Deployment in Africa: Challenges, Opportunities, and Pathways for Sustainable Energy Transition, *by Wulfran Fendzi Mbasso et al.* University of Douala, Douala, Cameroon
12:10-12:25	Iridescent Pattern Production from Solid Film Cellulose Nanocrystals Prepared from Coffee Husks *by Catherine Nyaruai Njeri* Dedan Kimathi University of Technology, Kenya & IPMT, Johannes Kepler University Linz, Linz, Austria
12:25-12:40	Celebrating 2 years of MIGRANTh-The Magazine on Migration and Development *by Isabella Schneider & Prof. Daniel A. M. Egbe* ANSOLE e.V., Wagnergasse 25, 07743 Jena, Germany
12:40-12:50	Fostering Astronomy Engagement in Africa through the PACS e-Lab Projects *by Miracle Chibuzor Marcel* Pan-African Citizen Science e-Lab, Federal Capital Territory, Abuja, Nigeria
12:50-13:30	**Lunch Break**
	Session 3: General Topics 2 **Chairpersons: Dr. David Wafula Wekesa & Nancy Obare**
13:30-13:50	**Keynote**: Accelerating SDG7 in Sub-Saharan Africa- The Role of ANSOLE and Emerging Technologies *by Vidvuds Beldavs* Riga Photonics Centre, Riga, Latvia
13:50-14:05	Energy Access: Are microgrids the answer? *by A. Meikle & Claudia Bess* Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE), Bridgetown, Barbados &. The Technical University of Kenya, Nairobi, Kenya

14:05-14:25	Progress in Gasification of Waste: Developments and Challenges *by Lilies K. Kathumbi* School of Computing and Engineering, University of Huddersfield, Huddersfield, United Kingdom
14:25-14:40	The State of Renewable Energy Research in Africa *by Sabrina Zearott* Willy Brandt School of Public Policy, University of Erfurt, Erfurt, Germany
14:40-14:50	Solar powered stove using volcanic stones *by Mariah Kizza* SWEDO Innovations Limited Plot 9912, Bukasa, Wakiso District, Uganda
14:50-15:00	**Coffee Break**
	Session 4: Solar Thermals **Chairpersons: Dr. Nadia Hillary Dassi & Catherine Nyaruai Njeri**
15:00-15:15	Fabrication and Experimental Investigation of a Solar Flat Plate Collector for Domestic Water Heating in Cameroon *by Dr. Jerome Ndam Mungwe et al.* Department of Renewable Energy, Higher Technical Teachers Training College, The University of Bamenda, Bamenda, Cameroon
15:15-15:30	Enhancing Thermal Energy Storage Efficiency in Solar Cookers Using HDPE/PLA Blended Phase Change Materials *by Emmanuella Brown Fasinu* Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
15:30-15:45	Integration of Solar-Thermal Energy into Biogas Production *by Eng. Nidal Abdallah & Eng. Omar Saffouri* Royal Scientific Society of Jordan, Amman, Jordan
15:45-16:00	Performance comparison of a wonderbag and Hay basket as thermal insulating materials for domestic cooking *by Dr. Oyirwoth P. Abedigamba, Pius Obia & Prof. Ashmore Mawire* Department of Physics, Kyambogo University, Kyambogo, Kenya & North-West University, Material Science, Innovation and Modelling (MaSIM) Research Focus Area, Department of Physics, Mahikeng, South Africa
16:00-16:15	Development of a new stand-alone indirect solar dryer for apple slices: Thermal profiling, drying characteristics and quality assessment *by Patrick Tsopbou Ngueagni, Prof. Ashmore Mawire & Katlego Diratsagae* Material Science, Innovation and Modelling (MaSIM) Research Focus Area, North-West University, Mahikeng, South Africa
16:15-16:30	Evaluation of Techno-economic Viability of Solar Water Heating System at MMU Executive Hostels *by Harrison Mutuma Muchee, Dr. David Wafula Wekesa, Dr. Solomon Namaswa* Multimedia University of Kenya, Nairobi, Kenya
16:30-16:45	**Closing remarks for the Day 1**

Day 2: Saturday, 22. Feb. 2025

9:30-10:00	Entering the virtual room and networking
	Session 5: Photovoltaics 1 **Chairpersons: Dr. Jerome N. Mungwe & Emmanuella B. Fasinu**
10:00-10:20	Advanced organic materials and technologies for solar photovoltaics *by Dr. Petro Smertenko, Dr. Vadym Naumov et al.* Lashkaryov Institute of Semiconductor Physics, NAS of Ukraine, Kyiv, Ukraine
10:20-10:40	Functionalization of silicon solar cell back contacts by using carbazole

	derivatives *by Dr. Petro Smertenko, Dr. Vadym Naumov et al.* Lashkaryov Institute of Semiconductor Physics, NAS of Ukraine, Kyiv, Ukraine
10:40-10:55	Techno-Economic Feasibility Analysis of Grid-Connected Solar PV System using Mono-Facial and Bi-Facial Modules in Public Senior High School in Ghana. 'A Case Study of Presbyterian Boys' Senior High School' *by Emmanuel Kengel Dankwa & Dr. Rahimat Oyiza Yakubu.* Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
10:55-11:10	Interface Study and Charge Carrier Dynamics in 2D-3D Heterostructured Mixed-Cation Lead Mixed Halide $FA_{0.75}Cs_{0.25}Pb(I_{0.77}Br_{0.23})_3$ Perovskite *by Dr. Milimo Amos Nalianya et al.* Department of Physics, Masinde Muliro University of Science and Technology, Kenya
11:10-11:25	Impact of front and back contacts on the performances of a-Si:H p-i-n solar cell *by Dr. Manelle Hannachi & Prof. Zahir Rouabah* Laboratory Physico-Chemistry of Materials, University Amar Telidji, Laghouat, Algeria &Smart materials and renewable energies laboratory, University Mohamed El Bachir El Ibrahimi, Bordj Bou Arreridj, El-Anasser, Algeria
11:25-11:40	**Coffee Break**
	Session 6: Photovoltaics 2 **Chairperson: Dr. Victor Odari & Judith Letsoalo**
11:40-11:55	The combined effect of thermal treatment and cerium doping on Black Titanium dioxide nanoparticles for perovskite solar cell applications *by Tebogo Selema* Sefako Makgatho Health Science University, South Africa
11:55-12:10	Advancing Perovskite Solar Cells: Optimizing TiO_2/Graphene Electron Transport Layers for Enhanced Performance and Future Standardization *by Tshegofatso Sewela* Sefako Makgatho Health Science University, South Africa
12:10-12:25	Fault Diagnosis in Photovoltaic Systems Using Supervised Machine Learning Models *by Patience Tifuh Taah et al.* Department of Electrical/Electronic Engineering, NAHPI, University of Bamenda, Bamenda, Cameroon
12:25-12:40	Advanced IoT-Based Monitoring System for RealTime Photovoltaic Performance Evaluation: Conception, Development and Experimental Validation *by Dr. Njimboh Henry Alombah et al.* Department of Electrical and Electronics Engineering, College of Technology, University of Bamenda, Bambili, Bamenda, Cameroon
12:40-12:55	Bridging Data Scarcity in Africa: A Novel Synthetic Climatic Model for Machine Learning-Driven Renewable Energy Optimization *by Ambe Harrison, Dr. Njimboh Henry Alombah & Dr. Wulfran Fendzi Mbasso* Department of Electrical and Electronics Engineering, College of Technology (COT), University of Buea, Buea, Cameroon
12:55-13:30	**Lunch Break**
	Session 7: Photovoltaics 3 **Chairperson: Prof. Louiza Boudiba & Patience Tifuh Taah**
13:30-13:45	Machine Learning Models for Solar PV power Forecasting: A performance Evaluation *by Noel Nkwa Awangum* Department of Electrical/Electronic Engineering, NAHPI, University of

	Bamenda, Bamenda, Cameroon
13:45-14:00	Numerical Study of RbCsFAPbI1-xBr$_x$ Perovskite for Photovoltaic Application by SCAPS-1D *by Nancy Obare et al.* Department of Physics, Masinde Muliro University of Science and Technology, Kakamega, Kenya
14:00-14:15	Design, Synthesis and Characterization of Conjugated Terpolymers for Photovoltaic Applications *by Rupali Jadhav-Chavan et al.* Dr. Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India.
	Session 8: Electrochemical Processes **Chairpersons: Dr. Rahimat Yakubu & Bernard Wambua**
14:15-14:30	Biosynthesis of silver nanoparticles for electrochemical quantification of sunset yellow *by Dr. Hassan Oriyomi Shoyiga & Prof. Omolola Esther Fayemi* MaSIM, North-West University, Mahikeng, South Africa
14:30-14:45	Electrochemical sensor for the detection of sunset yellow in food using polyaniline/carbon nanopowder nanocomposite modified electrode *by Judith Letsoala* MaSIM, North-West-University, Mahikeng, South Africa
14:45-15:00	Development of green and chemical synthesis routes of Au/MWCNT nanocomposites for the voltammetric detection of methylene blue dye in river water samples *by John Sekele Mokole* MaSIM, North-West University, Mahikeng, South Africa
15:00-15:15	Electrochemical evaluation of ethyl acetate extract of Taxus Baccata as corrosion inhibitor for carbon steel in acidic medium *by Dr. Karima Hanini et al.* Tebessa University, Tebessa, Algeria
15:15-15:30	Electrochemical assessment of the ethanolic extract of an Algerian flora species as an additive in zinc electroplating *by Hadjer Ghalloussi* Tebessa University, Tebessa, Algeria
15:30-15:45	Square Wave Voltammetry Determination of Iron Concentration at Screen Printed Modified- SPEEK-PANI Electrode *by Kabelo S. Banda & Prof. Omolola E. Fayemi* Material Science Innovation and Modelling (MaSIM) Research Focus Area, Faculty of Natural and Agricultural Sciences, North-West University, Mafikeng, South Africa
	Session 9: Other Topics **Chairpersons: Prof. Omolola Esther Fayemi & Noel Nkwa Awangum**
15:45-16:00	International Institute of Refrigeration (IIR) Sustainable Cooling Funded Projects *by Dr. Ina Colombo* The International Institute of Refrigeration (IIR), Paris, France
16:00 -16:15	Comparison of the Performance of Biodiesel from Jatropha and Castor Oils in an Unmodified Diesel Engine *by Dr. Nadia Hillary Dassi Djoukouo et al.* Faculty of Agronomy and Agricultural Sciences, University of Dschang, Dschang, Cameroon
16:15-16:30	Assessment of Lead Concentration in Surface Soil in the Industrial Area *by Dr. Mirela Alushllari & Dr. Silvana Mico* University of Tirana, Tirana, Albania
16:30-16:45	Preliminary screening of phytochemicals in a plant species from eastern Algeria *by Randa Bayoud* Tebessa University, Tebessa, Algeria

16:45-17:00	Impact of mining iron dust on the phenolic antioxidants, and biological activities of *Atriplex halimus* L. *by Prof. Louiza Boudiba et al.* Tebessa University, Tebessa, Algeria
	Extraction and characterisation of hibiscus acetosella leaves' dye and its application to cotton and polyester fabrics using mordants *by Bernard Wambua* Dedan Kimathi University of Technology, Kenya & IPMT, Johannes Kepler University Linz, Linz, Austria
17:00-17:20	***Closing Remarks by organizers***

WAITRO WORLD ASSOCIATION of INDUSTRIAL & TECHNOLOGICAL RESEARCH ORGANIZATIONS

World Association of Industrial and Technological Research Organisations (WAITRO): Past, Present and Future

Paul Burrows

JITRI – Jiangsu Industrial Technological Research Institute, Nanjing, China

Abstract

The World Association of Industrial and Technological Research Organisations (WAITRO) is an independent, non-governmental, not-for-profit association founded in 1970 under the auspices of the United Nations. WAITRO brings together stakeholders in science, technology and innovation, including research and technology organisations and research universities, at the international level and provides a mechanism for its members and partners to connect, collaborate, share, inspire and multiply their contributions to solving global challenges and contributing to the UN Sustainable Development Goals. WAITRO is the global family of innovation.

This keynote will provide a general overview of the association (governing bodies, membership, past and present activities) and will focus in particular on the future of the association following the establishment of WAITRO e.V., a German-based legal entity that will represent the interests of WAITRO and provide a wide range of opportunities for its members.

Biography

Prof. Paul Burrows has been Secretary General of the World Association of Industrial and Technological Research Organisations (WAITRO) since 2019, and his term of office ends in February 2025. He is Vice President of the Jiangsu Industrial Technology Research Institute (JITRI) in Nanjing, China, where he heads the WAITRO Secretariat. He holds a PhD (1989) in Physics from Queen Mary University of London with a focus on molecular electronic devices. His extensive career includes research positions at the Riken Institute in Japan, the University of Southern California and Princeton University. Notably, he co-invented phosphorescent organic light-emitting devices (OLEDs) and has over 110 publications and 124 issued US patents in related fields. Prior to joining JITRI, he held senior positions at the Institute of New Energy in Shenzhen, China, and the Pacific Northwest National Laboratory in the United States. Email: burrows@jitri.cn

World Conference on Photovoltaic Energy Conversion (www.wcpec-9) in Daejon, Korea (https://www.wcpec9-korea.com)

Woo Kyoung Kim

School of Chemical Engineering, Yeungnam University, Yeungnam, South Korea.

Abstract

The World Conference on Photovoltaic Energy Conversion (https://www.wcpec9-korea.com) will be held in Daejeon, Korea, from Sunday 15 November to Friday 20 November 2026. WCPEC-9 is hosted by the Korea Photovoltaic Society (KPVS), which is leading Korea's photovoltaic research and development, industry-academic research cooperation, and other initiatives. The KPVS has grown to over 2,000 members. KPVS and many Korean researchers have made great contributions to the PV industry. Attending WCPEC-9 is not only an opportunity to interact with world leaders in photovoltaics, but also to discover Korea and in particular the host city of Daejon. African participants are welcome to attend.

Prof. Woo Kyoung Kim is a professor in the Department of Chemical Engineering at Yeungnam University, Korea. He received his B.S. degree in chemical engineering from Sung Kyung Kwan University (1994), his M.S. degree in chemical engineering from Seoul National University (1996), and his Ph.D. degree in chemical engineering from the University of Florida (2006). He also spent a year as a postdoctoral researcher at the Institute of Energy Conversion at the University of Delaware. His current research focuses on thin film photovoltaics, bifacial Si PV modules and their applications. He has been an Associate Editor of the IEEE Journal of Photovoltaics since 2014. He is the main organiser of WCPEC-9 in Daejon, Korea, in 2026. Email: wkim@ynu.ac.kr

Durability of hybrid laminates for renewable energy technologies (photovoltaics, wind power & electric vehicles)

Gernot M. Wallner
Christian Doppler Laboratory for Superimposed Mechanical-Environmental Ageing of Polymeric Hybrid Laminates (CDL-AgePol), Insitute of Polymeric Materials and Testing (IPMT), Johannes Kepler University Linz, Altenberger Str. 69, A-4040 Linz, Austria
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Abstract
Advanced polymeric/inorganic multi-layer laminate structures are of prime interest to a range of novel technology fields such as in the renewable energy sector. The near-service conditions in hybrid laminates typically consist of superimposed mechanical stresses and environmental factors. In many of the applications of such polymeric hybrid laminates, debonding between the laminate layers is a common damage and failure mechanism. However, resulting from the multi-layer laminate structure and the overall mechanical-environmental loading conditions, the specific loading conditions at the interfaces are highly complex, and the underlying mechanisms of ageing-induced delamination are as yet poorly understood.
Hence, novel environmental fracture mechanics methods allowing for delamination crack growth investigations to determine the kinetics of delamination in hybrid laminates under superimposed mechanical-environmental conditions will be presented and discussed. These methods are applied to a range of laminate materials (electrical steel; silicon; glass; epoxy resins; ethylene-based copolymers), for which the material structure and the processing conditions are varied systematically to deduce structure-processing-property-performance correlations. Regarding the environmental conditions, dry and humidified air as well as aqueous or oleaginous fluids are considered at temperatures below and above the glass transition of the polymeric adhesive layer.
For photovoltaic module laminates it is revealed, that under hot-humid conditions acetate-based comonomers trigger the formation of acidic degradations products and the diffusion of sodium ions from silicate glass into the fracture process zone resulting in brittle failure at the glass/polyolefin encapsulant interface. The debonding performance of electrical steel/epoxy laminates, which are of relevance for wind power generators or electric engines, is highly dependent on the epoxy equivalent weight and the OH-functionality of the resin, but also the type of heat carrier fluid.

Key words: hybrid laminates, fracture mechanics, debonding, durability

Acknowledgments: The financial support of the Austrian Federal Ministry for Digital and Economic Affairs, the National Foundation for Research, Technology and Development and the Christian Doppler Research Association is gratefully acknowledged.

Biography

Prof. Dr. Ing. Gernot Wallner studied polymer engineering and science at the University of Leoben, where he received his diploma in April 1994 and his doctorate in November 2000. He habilitated on functional polymer materials at the same institution in June 2008. Since January 2010 he is a member of the Institute of Polymeric Materials and Testing (IPMT) of the Johannes Kepler University Linz, Austria, where he is currently an extraordinary university professor and head of the Christian Doppler Laboratory for Superimposed Mechanical-Environmental Ageing of Polymeric Hybrid Laminates. His research interest are polymeric materials and sustainable development as well as polymer durability and regenerative resources.

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Empowering the Global South: The Impulsouth Community of Practice for a Gender-Just Energy Transition

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Abstract
The Impulsouth Community of Practice (CoP) is an innovative initiative driving capacity-building efforts to foster a gender-just energy transition across the Global South. Energy transition is much more than technology: it's about equity and inclusion, policy and governance, economic transformation, education and awareness, and community empowerment. Achieving all of these requires openness to changing habits, standards, and ways of life. Education is the path to driving these changes. The CoP is a major component of the Impulsouth initiative, supported by Fundación Avina and the United Nations University and funded by the International Development Research Center (IDRC). The CoP actively strengthens institutions through peer learning, knowledge sharing, and collaboration. We aim to create shared knowledge, built within the sectors themselves, crossing perspectives from actors often excluded. It unites universities, NGOs, enterprise support organizations, sectoral associations as well as regional and international organizations to address capacity gaps and amplify South-South cooperation related to the energy transition in 9 targeted countries.

This presentation will showcase the importance of capacity-building and peer-to-peer learning in energy transition, the CoP's unique approach to bridging institutional and policy gaps, emphasizing its role in empowering women within the energy sector. By highlighting its key activities, such as the Train of Trainers program, small grants for scaling up capacity-building initiatives, and an open-access knowledge repository, the presentation will underline the tangible benefits for members. Participants will also learn how joining the CoP offers access to global dialogue opportunities and fosters collaboration towards innovative solutions for advancing just energy transitions.

We aim to inspire new organizations to join this dynamic community and collectively contribute to an equitable and sustainable energy future. Further information about Impulsouth can be found here: https://impulsouth.org/

Biography

Mirana Andriarisoa is the Programmatic Coordinator for Avina's Regional Strategy in Africa and the Research and Learning Lead for Phase II of the Impulsouth project. She has over three years of experience in climate transparency with the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat. Mirana is deeply passionate about sustainable development, with a particular focus on initiatives that drive meaningful and transformative impact in rural communities. *Email: mirana.andriarisoa@avina.net*

Advancing the Sustainability of Perovskite Photovoltaics for Energy Access and Circular Economy

Matthew Lloyd Davies[1,2], Mark Spratt[1] and Trystan M. Watson[1]*

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[2]University of KwaZulu-Natal, School of Chemistry and Physics, Durban, South Africa
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Abstract

Perovskite solar cells (PSCs) are a promising emerging photovoltaic technology on the brink of commercialization. With record power conversion efficiencies exceeding 26%, they offer a viable route to low-cost, low-embodied energy photovoltaics. Their development is particularly timely as the world faces urgent climate challenges and the limitations of linear economic models. A transition to a circular economy, underpinned by sustainable and regionally appropriate energy technologies, is critical for long-term environmental and socio-economic stability. However, the widescale deployment of PSCs and other green technologies presents sustainability challenges, including reliance on critical raw materials, environmental impacts of mining and production, and waste generation at end-of-life.[1,2] Ensuring true sustainability requires a holistic approach that integrates lifecycle optimization from the outset—minimising production-related environmental impacts, extending device longevity, designing for end-of-life reusability, and substituting high-impact materials with sustainable alternatives.[3]

At Swansea University, the UNESCO Chair in Sustainable Energy Technologies and the SPECIFIC Innovation and Knowledge Centre are at the forefront of advancing the sustainability, understanding, and scalable deployment of perovskite photovoltaics.[1,4,5] Through the TEA@SUNRISE initiative, we are establishing an international network to explore how next-generation solar technologies can transform energy access in Low- and Middle-Income Countries (LMICs), with a focus on developing distributed manufacturing models and integrating circular economy strategies. In parallel, the newly launched REACH-PSM project aims to develop sustainable, regionally appropriate photovoltaic materials and manufacturing pathways, addressing critical resource constraints and supporting the localisation of solar energy production.

[1] Energy Environ. Sci., 2023, 16, 3711-3733.
[2] Green Chem., 2021, 23, 2471–2486.
[3] Energy Technol., 2021, 9, 2100312.
[4] Adv. Mater. 2023, 35, 2208561.

[5] ACS Appl. Energy Mater. 2024, 7, 5, 1938–1948.

Biography

Professor Matthew Davies is the UNESCO Chair in Sustainable Energy Technologies, Head of the Applied Photochemistry Group, and part of the Senior Management Team at the SPECIFIC IKC. He is a member of both the Materials Science and Engineering Department and the Chemical Engineering Department at Swansea University. He is also the Principal Investigator of REACH-PSM and TEA@SUNRISE, two major international research initiatives focused on advancing sustainable solar technologies and energy access in Low- and Middle-Income Countries (LMICs).

Prof. Davies is President of the Royal Society of Chemistry Environment, Sustainability and Energy Community Council and an Honorary Professor at the University of KwaZulu-Natal in Durban, South Africa. His research focuses on the photochemistry of materials for low-cost photovoltaic applications, aiming to improve stability, sustainability, light harvesting efficiency, and performance. His work primarily explores perovskite photovoltaics, with a particular interest in the characterization of re-manufactured devices and developing materials and processes that enable reuse and re-manufacture within a circular economy.

As Principal Investigator of REACH-PSM, he leads efforts to develop regionally appropriate, sustainable photovoltaic materials and manufacturing pathways, strengthening supply chains and advancing circular economy principles in solar energy. Through TEA@SUNRISE, he is establishing an international network to support next-generation solar technologies for energy access in LMICs, reporting to the UK Foreign, Commonwealth & Development Office (FCDO) through the Carbon Trust.

Prof. Davies strongly believes that access to sustainable and renewable energy is a necessary precondition to achieving many of the Sustainable Development Goals, extending far beyond the energy sector. He advocates for renewable energy technologies designed within a circular economy framework, maximizing social, health, educational, and environmental benefits globally. Email: m.l.davies@swansea.ac.uk

Solar Energy Research at North-West University (NWU)

Ashmore Mawire[1,2]
[1]Department of Physics and Electronics, North-West University, Mahikeng, South Africa
[2]Material Science, Innovation anf Modelling (MaSIM) Research Focus Area, North-West University Mahikeng, South Africa

Prof Ashmore Mawire holds a PhD in Applied Physics from the North-West University in South Africa which he obtained in 2010. He is a Professor in the Department of Physics and Electronics at the North-West University. He is the Director, and the principal researcher in the solar thermal group of the Material Science, Innovation and Modelling (MaSIM) research focus area. His research interests include electronic instrumentation, renewable energy systems, heat transfer, solar food processing and solar thermal energy storage technology. He has published many high-impact factor ISI journal articles and presented papers at several peer-reviewed international conferences. His research is mainly focused on domestic solar thermal energy storage applications. He is an Associate Editor of the Journal of Energy Storage. He is also an Editor of Scientific

African which promotes research endeavours from researchers in Africa. He has received several national and international research grants geared towards Sustainable Energy Technologies**.** Email: ashmore.mawire@nwu.ac.za

Identifying the best locations for solar and wind power through energy modelling

David Wafula Wekesa
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Abstract
In many geographies, energy models are pointing towards sources of variable renewable energy (VRE), mainly solar PV and wind power, as potential backbones of future power systems. However, such models were historically not able to include explicit geospatial aspects around the siting of future VRE power plants in the cost-optimization from the outset. For instance, should one build far from the grid in search of excellent resources, or rather stay close to existing infrastructure to keep costs low? Here, we present an OSeMOSYS-FlexTool workflow for capacity expansion and dispatch optimization that explicitly includes the geospatial dimension of VRE buildout. Applying the model to Kenya, we identify clear but nontrivial links between site characteristics and siting preferences in the optimization results, which moreover differ markedly for solar PV and wind power. This highly replicable approach has important implications for power system planning, especially in countries whose grids will be VRE-heavy in the future.

Keywords: Energy Models; OSeMOSYS-FlexTool; Solar PV; VRE; Wind Power.

Biography

Dr. Wekesa is a senior lecturer of renewable energy technology, proficient and experienced energy consultant with over fifteen (15) years of experience in research and development. He holds a Ph.D. in renewable energy technology, a licensed Energy Auditor by Energy and Petroleum Regulatory Authority (EPRA) and a Certified Energy Manager (CEM) by Association of Energy Engineers (AEE). He is currently the Team Lead Renewable Energy Research Consortium (RERC) and Chairman Department of Physics at Multimedia University of Kenya. In addition, Dr. Wekesa is the Head of Capacity Building, Research and Development Committee at Association of Energy Professionals Eastern Africa (AEPEA). Email: dwekesa@mmu.ac.ke

Scientists of Kenya Association (ScoKA): Championing the cause of Kenyan Scientists

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Abstract

SCOKA, a non-profit association built under different science disciplines, was born in 2023 via visionary leader Miss Everlyn Kimathi and other members who shared her dream of providing a platform to voice reason in many science disciplines. Since its establishment in 2023, SCOKA has been a leader in conceptualizing science-related matters as a critical community aspect involving different stakeholders from different scientific fields of study. The Association demonstrates how science can build bridges between societies where official relationships strained, strengthens interactions and partnerships between the scientific and diplomatic communities, and develops the intellectual framework and training to support varying issues affecting the scientific community. Structured to provide a voice of reason to people in the various fields of science, protect their needs, and advocate for better services for members. Our mission is to champion the cause of Kenyan Scientists and deliver unwavering support, fostering a thriving scientific community. Whether it is a reassuring conversation, education, professional training, or simply the assurance that they are not alone, we will ensure that everyone gets support that meets them where they are at as quickly as possible. Our vision is to ascend as the foremost scientific association in Kenya and globally by pioneering and supporting aspects of innovative scientific solutions. Our team envisions a Kenya and a world where scientific innovation thrives, benefiting society. We aim to become the leading scientific association, both nationally and internationally, by fostering groundbreaking research and supporting the development of innovative scientific solutions across all fields. We support scientists and scientific advancement in Kenya and globally! We foster collaboration among scientists, promote innovative scientific solutions, and act as a bridge between the scientific community, the government and the public. Email: info@scoka.co.ke

African Network for Solar Energy e.V. (ANSOLE e.V,) International & Local Affairs and Sustainability Practices.

Nnenna Veronica Ebem & Daniel Ayuk Mbi Egbe
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Abstract

The African Network for Solar Energy (ANSOLE) is dedicated to fostering research, education, and capacity building in renewable energy across Africa and beyond. Through its international and local operations, ANSOLE facilitates knowledge exchange, training programs, and collaborative projects aimed at enhancing energy access and sustainability. Its initiatives support young researchers, promote solar energy solutions, and strengthen partnerships between academia, industry, and policymakers. Locally ANSOLE is engaged amongst other things in counselling and support of people of African origin in Jena and its surroundings and publishes a magazine on migration and development (MIGRANTh). This presentation will highlight ANSOLE's impact, key activities, and opportunities for stakeholders to engage.

Nnenna Veronica Ebem is an experienced young lawyer with over 6 years of post-call practice and over 5 years work experience in the Renewable Energy and Electricity Industry, she currently works with African Network for Solar Energy (ANSOLE) as a Volunteer (Bundesfreiwilligendienst). one of her numerous achievement includes her contribution in the development of a community paper in partnership with the World Economic Forum, the paper is on Mobilising investment for Clean Energy in Emerging Economies, the community paper went through series of consultations with relevant stakeholders in the sector and it proffers solutions to clean energy financing in Nigeria which is a developing country and an emerging economy. Nnenna volunteers for a lot of Youth Organisation on Advocacy and clean energy adoption among rural communities. Email: veronica.ebem@ansole.org

Prof. **Daniel Ayuk Mbi EGBE** is presently the CEO and Chairperson of the African Network for Solar Energy e.V. (ANSOLE e.V). He was born on 20th May 1966 in Mambanda-Kumba, South-West Region of Cameroon. He obtained a BSc in Chemistry in 1991 at the then University of Yaounde (now University of Yaounde I). He moved to Germany in October 1992, where he obtained a MSc (Diplom) and PhD in Chemistry in 1995 and 1999, respectively, from the Friedrich-Schiller University (FSU) of Jena. He completed his Habilitation in Organic Chemistry at the same institution in 2006. From 2006 to 2008, he was a postdoctoral fellow at the Max Planck Institute for Polymer Research in Mainz, Germany, the Technical University of Eindhoven in the Netherlands, and the Technical University of Chemnitz, Germany. In 2009 he moved to the Johannes Kepler University (JKU) Linz, Austria, where he worked at the Linz Institute for Organic Solar Cells (LIOS) (2009-2016) and then at the Institute of Polymeric Materials and Testing (IPMT) (2016-2020). After the end of his contract at the IPMT, he became a visiting scientist at the IPMT and at the Institute of Polymer Chemistry (IPC) of the JKU. From October 2021 to September 2022 he worked as a senior scientist at the Energy Institute of JKU. Since November 2021 he is Honorary Professor of Organic Chemistry at the College of Science and Technology of the University of Rwanda, Kigali, Rwanda. Since June 2022 he is also Extraordinary Professor of Renewable Energy and Chemistry at North-West University, Mahikeng, South Africa.

Egbe's main research interest is the design of semiconducting materials for organic solar cells and other optoelectronic applications.

He is a member of the Organic Electronics Association (OE-A), a board member of the World University Service Germany e.V. (WUS-Germany), a board member of MigraNetz Thüringen e.V. (2020-2022) and a member of the Migration and Integration Council of the City of Jena. In November 2010 he initiated and co-founded ANSOLE (www.ansole.org) in February 2011 and became its international coordinator due to his multilingual skills. In September 2011, he initiated and co-founded ANSOLE e.V., a non-profit association based in Germany that legally represents ANSOLE. In 2012, he initiated the Cameroon Renewable Energy Network (CAMREN), an NGO that represents the interests of ANSOLE in Cameroon. He also initiated and coordinates the research platform BALEWARE (Bridging Africa, Latin America and Europe on Water and Renewable Energies Applications)

From 2015 till 2017 he was member of the scientific council of the "Ecole Supérieure des Métiers des Energies Renouvelables (ESMER), in Benin. From 2015 till 2016 he was part of the team which developed research programs at the Pan African University Institute of

Water and Energy Sciences (including Climate Change) (PAUWES) in Tlemcen, Algeria, an institution of the African Union.

Since 2015 he is an Independent Evaluator for the World Bank Group and African governments in the selection process of the African Centres of Excellence (ACEs) and African Host Universities (AHUs) with corresponding eligible students in the frame of PASET (Partnership for skills in Applied Sciences, Engineering and Technology)- RSIF (Regional Scholarships and Innovation Fund)-Programme.

In 2016 he was appointed the first Distinguished Brian O´Connell Visiting Fellow of the University of the Western Cape, South Africa, in recognition for his outstanding contribution in human capacity building in Higher Education in Africa.

He was initiator and director of the VolkswagenStiftung-sponsored Summer Schools on "Sustainable Energetics for Africa" (2015-2017). He is presently visiting lecturer/Professor at various African universities.

In 2022 he was appointed leader of the SDG7 working group of the World Association for Industrial and Technological Research Associations (www.waitro.org)

He has published till date more than 140 peer-reviewed articles in renowned journals and (co)supervised numerous international students from Africa and elsewhere. He has coauthored 3 books on renewable energy.

He is the publisher of MIGRANTh (the Magazine on Migration and Development in Thuringia, Germany- www.migranth.de). He speaks more than 5 languages. He is a believing christian who enjoys dancing Salsa! Contact: Email: Daniel.egbe@ansole.org.

Ethical Impacts and Value Conflicts around H_2 storage in Salt Caverns in The Netherlands

Ineke Malsch

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Abstract

The European Union has the ambition to make Europe the first climate-neutral continent by 2050. The development of a hydrogen economy with green hydrogen is part of the solution. Large-scale storage of hydrogen is needed between production with renewable energy sources and use in industry and households. Salt caverns under land or sea offer promising storage options. The first location for such salt caverns is in the province of Groningen, where natural gas winning has been causing damaging earthquakes and public axiety for years. In this presentation, I present highlights of an Ethical Impact Assessment of this project. A key dilemma is how to solve the value conflict between risks for social justice and benefits for combating climate change. Options for remediation are proposed. Finally, the audience is asked to comment on how public concerns over the transition to a hydrogen economy are addressed in their country.

Biography

Dr. Ineke (N.H.) Malsch has graduated in Physics and holds a PhD in Philosophy. Her thesis was on international multistakeholder governance of nanotechnology. She is the founder and director of Malsch TechnoValuation, a consultancy in technology and society, established in Utrecht since 1999. Under the tradename EthicSchool https://ethicschool.nl/en-gb/home, she offers training in Responsible Innovation. She has so far contributed to fifteen EU-funded projects related to responsible development and governance of emerging technologies, including several projects related to renewable energy, water remediation and/or cooperation with developing countries in Africa and other parts of the world. In the International Networking Initiative on Safe and Sustainable Nanotechnology (INISS-Nano), she leads the pillar on "International collaboration on

ethical and societal aspects of nanotechnology". Locally, she coordinates a project on Sustainable Utrecht 2030: https://duurzaamutrecht2030.nl/en-gb

She has been the Dutch representative of the African Network for Solar Energy (https://ansole.org/) since 2012. In addition, she was involved in the launch of the BALEWARE (Bridging Africa, Latin America and Europe in Water and Renewable Energies Applications) network in Brazil and co-organiser of the first BALEWARE summerschool in Arusha, Tanzania in 2016. Email: malschtechnovaluation@xs4all.nl

Utilizing Jordan's Wind: Innovative Ways to Achieve SDG 7 Goal and Sustainable Energy.

Omar Khazaleh
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Abstract

Jordan faces major sustainability problems because its rising energy needs depend primarily on imported fossil fuels products. The international push towards Sustainable Development Goal 7 (SDG 7) requires Jordan to integrate its wind energy resources into its energy sector. This research will investigate the wind energy resources of the country by studying areas with high wind potential as well as analyzing technological improvements for optimal energy production. A detailed analysis will cover the financial implications together with existing policies and obstacles Jordan faces while trying to add major wind power to its grid. The research will investigate modernization of power grids and financial policy suggestions as well as technical solutions which boost wind energy adoption rates. The analysis will present evidence-based recommendations that stakeholders should implement to strengthen Jordan's renewable energy sector based on proven international models which will support energy stability and promote national growth while reducing climate impact. The results will demonstrate Jordan needs to implement technological solutions along with economic measures and policy actions suggestions to establish wind energy as its essential component in sustainable power supplies into the future.

Biography

Omar Khazaleh, born on February 24, 1999, in Amman, Jordan, is a dedicated Electrical Power Engineer with a distinguished academic and professional trajectory. Graduating with a Bachelor's degree from Yarmouk University's Electrical Power Engineering Department in 2022, Omar achieved an impressive GPA of 3.72, reflecting his deep commitment to his field. Currently serving as a Specialist / Studies in wind energy at the Royal Scientific Society (RSS). His role involves intricate tasks such as ensuring the operational efficiency of renewable energy sources, which are directly aligned with sustainable development goals, particularly SDG7 which advocates for affordable, reliable, sustainable, and modern energy for all.

Omar's professional journey also includes substantial experience with the Electrical Distribution Company (EDCO) in Jordan, where his responsibilities spanned across Maintenance, Metering, Substations, and Installations Departments. This role not only honed his technical skills but also equipped him with the ability to manage and execute complex electrical systems effectively.

In addition to his professional endeavors, Omar has contributed to the academic sector as a reviewer for the Journal of Engineering and Applied Science. He has authored several publications focusing on enhancing methodologies for maximum power point tracking (MPPT) in photovoltaic systems and has explored the reliability of speech/speaker recognition systems using deep learning technologies. Omar's technical

proficiency is broad and includes skills in Python programming, MATLAB, AutoCAD, and other simulation software. His hands-on experience with Arduino and PIC microcontrollers further complements his theoretical knowledge, making him a versatile and innovative engineer. *Email: omar.khazaleh@rss.jo*

Advancing Solar Energy Development in Africa: Challenges, Opportunities, and Pathways for Sustainable Energy Transition.

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Abstract
In Africa, the available solar energy resources are substantial, but these remain untapped due to various technical, economic, and policy issues. This paper attempts to provide an overview of solar energy deployment within Africa, stressing the major challenges and anticipated undertakings. It looks into the adoption of novel photovoltaic (PV) technologies, hybrid renewable energy systems, and new financing approaches which may assist in accelerating solar energy deployment. Also, special attention is given to the participation of artificial intelligence (AI) and optimization methods in improving PV system performance and grid reliability. In addition, a discussion is provided regarding the exploitation of local policies, inter-regional cooperation, and the African Continental Free Trade Area (AfCFTA) in relation to the solar energy market policy. The paper focuses on the mobilization of various stakeholders including governments, private sector actors, and academic and research institutions to develop integrated solar energy policies. Untapped opportunities offer African countries the chance to remove barriers to implementation and use new technologies to reach a powerful and all-encompassing energy paradigm. In this regard, this work lays down the foundation for framing the discourse for policymakers, scientists, and industry practitioners aimed at implementing solar energy at scale in Africa.

Keywords: Solar Energy, Photovoltaics, Hybrid Renewable Systems, Artificial Intelligence, Energy Policy, African Solar Market

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Biography

Wulfran FENDZI MBASSO received the M.Sc. and M. Res. degrees in electrical engineering from University of Ngaoundéré and University of Douala, Cameroon, in 2016 and 2020, respectively. Having obtained a PhD thesis in Electrical Engineering Option Optimization of Renewable Energy Systems, he is passionate about the field of Electric Engineering and Industrial Informatics. He received several global certifications. My research focuses on power system control, optimization, automation, and electronics. He is a dedicated PhD holder in renewable energy optimization. He possesses extensive electronics, electrical engineering, telecommunications, and automation experience. His researches innovative ways to optimize renewable energy use for a sustainable future. He develops advanced energy efficiency methods due to his expertise in these areas. His collaboration with international researchers has given me a broad view of research in several electrical engineering fields. This partnership has led to articles in Renewable Energy Systems, Energy Control, and Electricity Quality. He acts as reviewer for IJRER, Heliyon, Hindawi, AJEBA, and Sustainable Energy Research. He is also active on ResearchGate, where he supports science and engineering with his humble perspective. He can be contacted via email fendzi.wulfran@yahoo.fr, ORCID: https://orcid.org/0000-0002-4049-0716.

18 **Iridescent Pattern Production From Solid Film Cellulose Nanocrystals Prepared From Coffee Husks**

Catherine Nyaruai Njeri
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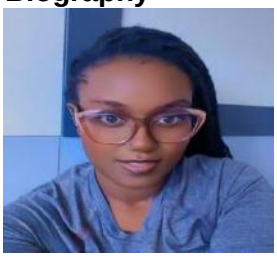
Abstract
The urgent need to practice environmental stewardship has spurred research into novel approaches to produce sustainable and biodegradable materials from natural sources, especially for engineering uses, with cellulose emerging as a top contender. By using coffee husks, a byproduct of making coffee, one can effectively repurpose waste material and turn it into a valuable and economically viable asset. This creates a sustainable reservoir of cellulose. Coffee husks contain cellulose, extracted using an alkaline treatment method and acid hydrolysis to produce cellulose nanocrystals (CNCs), which are used to create iridescent films. This procedure comprises bleaching the coffee husks with sodium hypochlorite after treating them with sodium hydroxide to extract cellulose. The next step is to apply acid hydrolysis to create cellulose nanocrystals using gaseous HCl. The CNC suspension is carefully poured into polystyrene Petri dishes and evaporated at regulated temperatures in an oven to produce a solid CNC film. This process ensures purity and guards against contamination. The CNC suspension-filled Petri dish is set atop an engraved mold with precise patterns to add complex patterns to the film. Heat applied to the mold causes a range of colors to appear on the film. The result of this process is the spontaneous self-assembly of CNCs, which produces a wide variety of colorful and iridescent films with unique optical properties. Moreover, these films exhibit exceptional water resistance, light color variation dependent on viewing angles, and left-handed circularly polarized light fluorescence and reflection, highlighting their versatile application and environmentally conscious design.

Biography



Catherine Nyaruai Njeri is a chemist with a strong background in chemistry, sustainability and ESG analysis. She is currently pursuing an MSc in Sustainable Plastics Management at Johannes Kepler University, Austria and an MSc in Chemistry from Dedan Kimathi University of Technology, Kenya
Beyond academics, Catherine is an active leader, having represented Africa in the Erasmus Mobility Exchange and held leadership roles in scientific and community organizations like the Scientist of Kenya Association. Passionate about innovation and sustainability, she aims to drive impactful change in the chemical and environmental sectors. Email: catenyaruai@gmail.com

Celebrating two years of MIGRANTh – The Magazine on Migration and Development

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Abstract
In order to document the life stories of people with a migration background living in the German state of Thuringia. Offering a variety of perspectives through firsthand accounts, it is a critical examination of attitudes towards and the realities of migration and integration. This presentation aims to introduce and consolidate *MIGRANTh*'s activities and trajectory over the last two years in terms of content, editorial direction and impact. Since its inception and over the course of its five issues, *MIGRANTh* has chronicled the life stories of people from 20 countries, five continents and nine locations in Thuringia. Moreover, it cooperated with and introduced numerous other organizations and projects related to migration in Thuringia, thus expanding and solidifying its network. In addition to book reviews and educational pieces, it has featured a wide range of articles on pressing and topical issues, such as Prof. Daniel Ayuk Mbi Egbe's speech “We are all migrants: Migration is not a one-way street!” or Yanda Bango's “Unconscious racism? Erfurt Zoo and how it perpetuates the dehumanization of Black people today”. *MIGRANTh* emphasizes the importance of diverse voices and backgrounds for a democratic Germany, especially in light of the current political shift towards right-wing, xenophobic policies. It is dedicated to breaking down prejudice and promoting acceptance and mutual understanding. Dedicated issues explore overarching themes such as decolonization and refugee migration routes (*MIGRANTh* 4 and 5, 12/2024) or women's voices for International Women's Day (*MIGRANTh* 3, 03/2024). ANSOLE e.V. anticipates the future of this project in 2025 with optimism.

Biography

Isabella Schneider studied English and English Literature at the University of Glasgow. She has been working as a volunteer for ANSOLE e.V. in Jena (Germany) since November 2023, primarily focusing on the project MIGRANTh – The Magazine on Migration and Development. Since joining the editorial team, she has been involved in the production of issues 2-5 and the bilingual edition. Email:Isabella.schneider@migranth.de

Fostering Astronomy Engagement in Africa through the PACS eLab Projects

Miracle Chibuzor Marcel
PACS e-Lab Community Pan-African Citizen Science e-Lab, Federal Capital Territory, Abuja: miracle.c.marcel@gmail.com

Abstract
The Pan-African Citizen Science e-Lab (PACS e-Lab) is an online platform that engages the African public in hands-on activities in space science and astronomy, including those in North Africa and Sub-Saharan Africa. We run five main projects, including exoplanet observations, asteroid searches, deep space image processing, double star research, and ARISS—amateur Radio on the International Space Station. Since its founding in December 2020, we have engaged over 1,000 individuals across 50 countries in Africa and made numerous contributions to astronomy, including the discovery of over 50 asteroids, the publication of over 12 scientific papers, and the generation of several photometric light curves of exoplanets. Our platform is the fastest-growing of its kind in Africa. During ANSOLE´s 14th Anniversary International Online Conference, I will elaborate on these efforts and our achievements.

Biography

Miracle Chibuzor Marcel is the Founder and Director of the Pan-African Citizen Science e-Lab (PACS e-Lab), an online platform dedicated to promoting hands-on activities in space science and astronomy across Africa. PACS e-Lab boasts the continent's most extensive network of amateur astronomers. Email: miracle.c.marcel@gmail.com

Accelerating SDG7 in Sub-Saharan Africa – The Role of ANSOLE and Emerging Technologies.

Vidvuds (Vid) Beldavs:
Riga Photonics Center – Co-Founder, ACES Worldwide – Board Member - website https://www.acesworldwide.org/, Email:vid.beldavs@fotonika-lv.eu

Abstract
Universal access to electricity is key to the development of sub-Saharan Africa. Access to electricity enables access to AI. AI is in a period of extraordinary development with the potential to accelerate development that could enable sub-Saharan countries to reach parity in development with Europe over the coming decade empowered with young populations and vast resources. It is imperative that access to electricity be treated as the key priority by both African states and their partners in Europe and elsewhere. ANSOLE needs to provide leadership for accelerating access to electricity across sub-Saharan Africa by incorporating AI into its Energy Compact with the UN and fostering greater intra-African integration to enable knowledge sharing and co-development between Northern African states and sub-Saharan states through ANSOLE facilitated programs.

Biography

Vidvuds (Vid) Beldavs is a futurist who developed a career in the US working for the multinational firm Cummins in strategic planning, teaching, leadership of the international Technology Transfer Society, consultant for Hudson Institute, analyst with Wikistrat of future trends and other roles. Vid works in Latvia and is a co-founder of Riga Photonics Centre advancing projects in application of science and technology for sustainable development. Vid also serves on the board of directors of the

ACES Worldwide a space policy organization focused on space science and technology to drive sustainable development and innovation for human development. Vid is active with ANSOLE providing leadership for engagement with the Science Summit in the framework of the UN General Assembly and specific projects driven by ANSOLE's Energy Compact with the UN.

Energy Access: Are microgrids the answer?

Algon Meikle[1], Claudia Bess[2]
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Abstract
According to the Energy Institute, on average, the world energy use per person in 2023 was 21,394 kWh, in comparison to regions such as Africa and low-middle-income countries where the consumption was 3969 kWh and 6067 kWh per person respectively (US EIA, 2023). This is indicative of the immense disparity in energy access for industrialized/high income countries compared to that of developing countries. Energy poverty defined as the "inability to cook with modern cooking fuels and the lack of a bare minimum of electric lighting to read or for other household and productive activities at sunset" (UNDP 2005) has been a key principle to be addressed under facilities such as the Sustainable Development Goals (SDGs). Concomitantly, in the UNDP's Beyond access: 1.18 billion in energy poverty despite rising electricity access Report, it is stated that globally, some 1.18 billion people are energy poor and unable to use electricity. Although reports show that access to electricity since 2020 has reached 90% (Min et al., 2024), it has been recognized that having access is severely undermined when the reliability, sustainability and cost render the access immaterial. This is compounded by the fact that there is a direct correlation between energy poverty and economic poverty, with people living in rural areas being more likely to be energy-impoverished than those in urban areas (Min et al., 2024; International Crisis Group, 2007; Domenech et al,, 2014). Energy systems are designed to address challenges such as energy access, sustainability goals and climate change mitigation, with renewable energy resources currently being deployed on a large scale to meet the requirements of increased energy demand, mitigate the environmental pollutants, and achieve socio-economic benefits for sustainable development. The integration of such distributed energy sources into utility grid paves the way for microgrids. The microgrid concept is explored as an option to address the issue of access to energy, reliability and sustainability.

Keywords: Microgrid. Energy Access, Renewable Energy.

Biography

Algon Meikle: With more than 25 years of experience in the electrical power industry, Mr Meikle has assessed the integration requirements for distributed energy resource projects including solar PV systems and wind farms and interconnection studies to ensure reliable connection under fault conditions with works within the Caribbean and North America. A highly skilled Electrical Engineer he is adept in using power system analysis including conducting critical grid assessment studies and develop solutions to ensure grid stability and economic viability. Mr Meikle holds a Bachelor of Science (BSc) degree in Electrical and Computer Engineering from the University of the West Indies (St Augustine), a Registered Profession Engineer and is a member of several professional bodies. Email: algon@ccreee.org

Claudia Bess has chartered a career centered on sustainable development practice. She has extensive experience in sustainability initiatives particularly within the water supply, wastewater treatment processes and energy governance sectors. She has worked in Jamaica, Canada, and Kenya in various capacities focused on development project design and implementation. Her areas of expertise in institutional analysis, water and wastewater supply systems, and energy management strategies have been of tremendous benefit to these initiatives. During her career, she has collaborated with bi- and multilateral organizations in projects aimed at enabling efficient institutional structures and environmental management systems. She has over 20 years professional experience in the environmental sector; with the last six years in academia, honing and influencing the next generation of young minds to be the muchneeded positive change makers in the environmental governance field. Claudia holds degrees in Chemical and Process Engineering, Project and Resource Management, and Energy and the Environment. She is a registered Professional Engineer and a registered Environmental Professional. Email: claudiabess@hotmail.com

Progress in Gasification of Waste: Developments and Challenges

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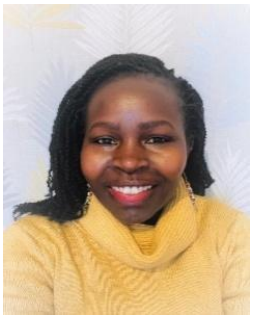
Abstract

Conversion of waste to energy is becoming essential for waste treatment to reduce landfill and associated CO2 emissions. Amongst the different waste to energy technologies available, gasification has been reported to be the most suitable method for decentralized electricity generation with lowest environmental pollution. Gasification has emerged as a promising solution to reduce landfill waste, mitigate environmental pollution and contribute to clean energy generation. However, this technology has not penetrated the market into commercial scales as expected.

This review examines the progress and challenges of waste gasification, it explores advancements in gasification technologies, focusing on system designs, operational techniques, syngas purification methods and applications in electricity generation. The challenges of scaling up and achieving economic feasibility are highlighted. The study then points out potential interventions and future directions for advancing waste gasification to enable commercial scale adoption.

Biography



Lilies Kathami Kathumbi is a dedicated research assistant at the University of Huddersfield, specializing in renewable energy technologies with a focus on biofuels, engine performance, emissions characterization, and waste-to-energy innovations. With over seven years of experience, she has developed innovative methodologies for biofuel production, including advanced catalysts that enhance biodiesel quality and reduce emissions. Her expertise spans life cycle assessments of energy systems, promoting sustainable and low-carbon fuel alternatives.

L.K.K. has demonstrated leadership in pioneering waste-to-energy projects, notably spearheading a black soldier fly larvae initiative that secured third place in the Africa-ai-Japan Innovation Poster Challenge (2021). She actively collaborates with

Kenyan researchers to foster sustainable waste-to-energy solutions for agricultural waste and interdisciplinary partnerships. As a key member of the Energy Integration Lab led by Prof. John Allport at the University of Huddersfield, she contributes to industrial partnership and research in low-carbon fuel technologies.
Beyond academia, she is a registered member of the Engineering Board of Kenya and a reviewer for the Nigerian Journal of Technological Development. She also engages in the Kirklees Sustainability Peer Group, bridging research with industry stakeholders to drive emissions reduction and sustainable practices. Her contributions to renewable energy, circular economy and climate change mitigation align with the core themes of the ANSOLE conference, where she aims to share insights and collaborate on innovative solutions for a greener future. Email: L.Kathumbi@hud.ac.uk

The State of Renewable Energy Research in Africa

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Abstract
African countries are only somewhat on track to meet SDG7 by 2030, according to the International Renewable Energy Agency (IRENA). This is despite enormous renewables potential on the continent. However, renewables research in the African context shows great promise: African countries and research institutes are leading the way, with the Algerian Centre de Developpement des Energies Renouvelables (CDER) at #1 globally. Understanding the renewables research landscape in Africa – including collaborations and disconnects – is vital because it can point to places where government and private support can help further the energy transition. This talk discusses successes, potential for improvement, and the way in which both R&D and policy are vital for ongoing progress toward SDG7.
This speech was the keynote for ANSOLE's session on SDG7 at the United Nations 79th General Assembly Science Summit (SSUNGA79)

Biography

Sabrina Zearott is a Master of Public Policy student at the Willy Brandt School of Public Policy (University of Erfurt, Germany); she earned her AB from Harvard College and an MA in communication from Washington State University. Her research currently focuses on the clean energy transition, particularly regarding renewable energy and critical mineral supply chains. She interned at and volunteers with ANSOLE. She is the award-winning author of two books (under a pen name) and was credited in a technical-writing capacity in a 2019 *Science* cover article, "Strain-programmable fiber-based artificial muscle." She has several years' experience as a researcher, including at Harvard's Pluralism Project; she assisted with commercialization research on rare earth elements (REEs) at WSU and served as the main writer/editor/producer for WSU's *Physics Matters* magazine. Long-term, she hopes to work on policy analysis/research related to the clean energy transition and critical minerals in Germany/the EU. Email: sabrina.zearott@migranth.de

Solar powered stove using volcanic stones

Mariah Kizza

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SWEDO
EMPOWERING WOMEN

Our innovation addresses gender disparity and environmental degradation by promoting clean cooking solutions, like solar stoves, to reduce reliance on biomass fuels, improve women's health, and provide sustainable income alternatives, contributing to sustainable development in marginalized communities.

Our solution entails production for our solar stove, a clean cooking solution designed to address the challenges posed by traditional biomass fuels. With over 40 stoves sold under the pilot phase, we recognize the need to enhance the design and pursue certification to ensure quality and credibility.

The solar stove utilizes volcanic stones and briquettes/ pellets made from organic and agricultural waste, which are carbonized to ensure efficiency and sustainability. By leveraging these materials, we not only provide a cleaner cooking solution but also contribute to waste management and environmental conservation efforts.

In line with our commitment to empowering women and youth, we aim to skill an additional 10 women in stove manufacturing and Marketing. Establishing a dedicated workshop will enable us to scale up production and make the stoves readily available in the Greater Kampala Metropolitan Area (GKMA). Also, intend to establish a distribution network in five (5) districts of Wakiso, Kampala, Mukono, Lira and Soroti.

Each stove set costs UGX 200,000/ USD 60, and our goal is to reach over 500 restaurants in the GKMA over 5,000 target restaurants we intend to serve in our five-year business plan. Through this comprehensive approach, we aim to address the pressing need for clean cooking solutions, empower marginalized communities, and contribute to sustainable development in the region.

Our solar equipment like the panels, batteries and fans are imported from China, presenting a business case to connect with that international market thus our interest to participate in the WAITRO Summit in China.

Our project is committed to fostering inclusivity and empowerment for youth, women, and marginalized groups, recognizing their crucial role in social and economic progress. To address youth unemployment, we will provide comprehensive training and employment opportunities in stove manufacturing and distribution, equipping young people with valuable skills. Central to our initiative is women’s empowerment, with women trained to manufacture solar clean cooking stoves, achieving economic independence and leadership roles. SWEDO, a women-led social enterprise, ensures active participation of these groups throughout the project. By focusing on women-led restaurants and youth-led initiatives, we align with SDG 7 (Affordable and Clean Energy) and SDG 5 (Gender Equality), promoting sustainability and inclusivity.

Mariah Kizza is the CEO of SWEDO Innovations Limited (SWEDO), a company dedicated to tackling energy poverty and promoting gender equality through sustainable practices. With over 10 years of experience in the development sector, Mariah is recognized for her expertise in social entrepreneurship, research, innovation, project management, and organizational culture. She holds a Master of Science degree in Development Economics and a Bachelor's degree in Development Studies with a focus on rural development, equipping her with a strong foundation in economic development and sustainability.

Mariah began her journey with SWEDO in 2016, when the organization was founded as 'Smart Women in Environment and Development Organization.' The organization, which is 100% women-founded and managed, reflects Mariah's commitment to empowering women socially, economically, and environmentally.

Beyond her work at SWEDO, Mariah is actively involved in various professional networks that amplify her impact in the development and energy sectors. She is a member of the Social Entrepreneurship Forum by Capital Solutions, which fosters innovation and collaboration among social entrepreneurs. Mariah is also affiliated with the Uganda National Clean Cooking Alliance, where she contributes to promoting cleaner, sustainable cooking solutions across the country. Additionally, she is part of the National Renewable Energy Platform (NREP), which focuses on advancing renewable energy initiatives in Uganda. As a member of Mkazipreneur, a platform dedicated to supporting women entrepreneurs, Mariah continues to advocate for women's empowerment and economic development, aligning with her commitment to gender equality and sustainable growth. Contact: mariahkizza56@gmail.com/swedoprojects@gmail.com, Tel: +256782757919

Fabrication and Experimental Investigation of a Solar Flat Plate Collector for Domestic Water Heating in Cameroon

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Abstract

Global hot water demand per person has been on an increase over the years. The hot water demand per person per day is an average of 15 – 20 litres and about 20 m^3 per year. Hot water of 40 °C to 43 °C is mostly used for hygienic purposes, i.e. bathing while hot water of 20 to 60 °C is use for laundry and cleaning of dishes. The residential sector accounts for about 40 % of global energy consumption, thus, reducing energy consumption in this sector will contribute in the reduction of greenhouse gas emission and its consequent environmental effects of global warming and climate change. Heating water accounts for 25 % of residential energy use worldwide, and this is achieved mostly by burning fossil fuels. The main energy sources use to heat water in households of developing countries, such as Cameroon, is wood, kerosene, gas and/or electricity. The use of these forms of energy is not only very expensive but also have very negative impacts on the environment. Harnessing solar energy for water heating using solar water heaters can reduce household water heating fuel consumption to between 50 % and 70 %. The objective of the study was to fabricate a full-scale Flat Plate Serpentine Solar Domestic Water Heater (FPSSDWH) and to experimentally investigate its thermal efficiency under local environmental conditions. A flat plate serpentine solar domestic water heater was fabricated from carefully selected local materials. The choice and usage of local material ensured the low-cost of the final product. The thermal performance of the FPSSDWH, in terms of its thermal efficiency, was investigated under various local conditions on the campus of The University of Bamenda in Bambili. Results showed that the thermal efficiency of the collector varied with solar irradiance. The average solar irradiance recorded was 477 W/m^2 with a highest value of 915W/m^2. The average thermal efficiency of the FPSSDWH was 49.4 % and a highest value was 92.9 %. A difference of 11.5 °C between the inlet and outlet water was attained with the highest outlet temperature of 47 °C. From the foregoing results, it is concluded that locally fabricated FPSSDWH have demonstrated ability to produce hot water within temperature range applicable for domestic hot water services.

Keywords: solar energy, Flat plate solar collector, Warm water services, thermal efficiency

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Biography

Jerome Ndam Mungwe is a holder of a PhD in Science Technology Energetics and Nuclear (STEN) from Politecnico di Milano-Italy. Prior to his PhD studies, He obtained a M.Sc. in Energy Systems and Management from the University of Flensburg in Germany. His core professional value/belief is integrity in the applications of Engineering solutions to improve human living standards, especially in the rural areas of developing countries. He has professional experiences as a practitioner, researcher in Renewable Energy Technologies and an Academician. As a practitioner he has designed and supervised the construction of micro hydropower plants in some rural areas of Cameroon, designed and installed several solar PV home systems and domestic biogas systems. His research accomplishments include 10 published articles, chapter contribution to a book and a technology manual. He is currently researching on: Experimental investigation of a locally fabricated flat plat solar water heater, a business model of a plastic biogas digester system for rural and urban applications; performance evaluation of mini grids powered by renewable energy sources-Solar PV and Micro hydropower. He has participated in 7 international conferences. Professionally, he was a secondary school teacher (1998 -2006), technical adviser in Renewable Energy with an NGO in Cameroon (2008 -2010), Assistant Lecturer with the School of Engineering at the Catholic University of Cameroon-Bamenda (2010 -2019). He was an instructor at the National Higher Polytechnic Institute of the University of Bamenda (20192020)- He is currently a Senior Lecturer at the Higher Technical Teachers Training College of the University of Bamenda, where he is Head of Department of the Department of Renewable Energy Engineering cumulative with Head of Service for Training and Insternship. He is also member of the Scientific Committees of the Departments of Renewable Energy; Electrical and Power Engineering, HTTTC and Electrical and Electronic Engineering of the National Higher Polytechnic Institute of the University of Bamenda. He was appointed the ANSOLE National Representative in Cameroon (ANRIC) in August 2024.

Enhancing Thermal Energy Storage Efficiency in Solar Cookers Using HDPE/PLA Blended Phase Change Materials

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Abstract
The inconsistent availability of solar energy presents a significant challenge for solar cooking applications, necessitating effective thermal energy storage (TES) solutions. This study investigates the potential of High-Density Polyethylene (HDPE) blended with Polylactic Acid (PLA) as a phase change material (PCM) to enhance TES efficiency in solar cookers. A combination of thermal network modeling and Finite Element Method (FEM) simulations was employed to analyze the thermal behavior of HDPE/PLA composites compared to conventional PCMs such as Polypropylene (PP), Polyoxymethylene (POM), and pure HDPE. Material characterization was conducted using Fourier Transform Infrared Spectroscopy (FTIR), Differential Scanning Calorimetry (DSC), Scanning Electron Microscopy (SEM), and thermal conductivity tests. The results indicate that the HDPE/PLA blend with a 50/40 composition exhibited superior thermal conductivity, improved shape stability, and efficient heat transfer compared to other PCMs. The blend achieved a balanced trade-off between heat storage capacity and conductivity, making it an optimal candidate for sustained thermal performance during off-peak hours. While the study highlights the advantages of HDPE/PLA composites, further

experimental validation and optimization are recommended for broader applications in TES systems.

Keywords: thermal energy storage, phase change materials, solar cookers, HDPE/PLA blends, thermal conductivity, shape stability, finite element method, material characterization.

Biography

Emmanuella Brown Fasinu is a first generation female engineering graduate with multidisciplinary background in Renewable and Sustainable Energy, Energy Efficiency, Energy Policy and Planning, Clean Cooking and Materials Engineering. Her strong scholastic devotions right from Mfantsiman Senior High School, granted her an entry into Kwame Nkrumah University of Science and Technology, where she earned a Bachelor's Degree in Materials Engineering.

Born and bred in Ghana, she has unwavering passion in the sustainable development of Ghana and Africa at large. She focuses on environmentally friendly Research and Engineering approaches to solve societal problems, especial ones that affect Women and children through Renewable and Sustainable Energy.

As a result of her passion to become a leading authority advocating a continent-wide shift in distributed renewables for development, climate action, and energy independence, she is currently pursuing a Master's degree in Renewable Energy Technologies at the Kwame Nkrumah University of Science and Technology under the EU-ECOWAS Scholarship Program on Sustainable Energy. Her unflagging diligence facilitated an opportunity to be selected for an ERASMUS Exchange at Johannes Kepler University, Linz in Austria where she is able to leverage on the benefit of being exposed to cross cultural infrastructures, technologies, thinking systems, and approaches to advancing sustainable Energy and climate Actions.

The type of work she enjoys most involves conducting rigorous scientific research, analyzing and visualizing complex data sets, and translating findings into actionable policy recommendations. In the imminent futurity, she visualizes a long life's work that ensures all Africans gain access to affordable, reliable clean energy by 2050.

Integration of Solar-Thermal Energy into Biogas Production

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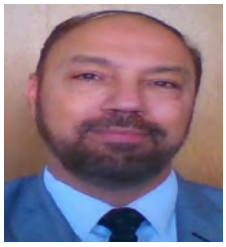
Abstract

In 2021, RSS has implemented a project in Jordan that harnessed the country's abundant solar energy resource to develop a biogas production system in the Za'tari Syrian Refugee camp. By incorporating locally produced solar heaters—at half the cost of imported ones—the project raised the operational temperatures of anaerobic digestion systems, creating thermophilic conditions that enhanced microbial activity. This accelerated the degradation of organic matter, leading to higher biogas yields and more efficient energy production.

The use of solar energy also reduced the need for additional energy inputs, making the biogas systems more cost-effective and sustainable. By maintaining higher temperatures,

especially during colder months, the overall efficiency of the systems was improved, while capital expenditures (CAPEX) were reduced. The reduction in CAPEX was further driven by the thermophilic process, which required less residence time and resulted in smaller system volumes. This made the technology more attractive to investors and developers, encouraging wider adoption of biogas systems.
This innovative integration of solar energy with biogas systems not only improved system performance but also reduced reliance on fossil fuels, driving down energy costs and enhancing waste management processes. The project has significantly contributed to transforming Jordan's biogas market, promoting greater sustainability and energy independence.

Biography



RSS is a leading institution in science and technology, offering specialized services through 38 accredited laboratories. It plays a key role in advancing sustainable development and innovation in Jordan, especially in energy efficiency and renewable energy. The National Energy Research Centre (NERC) at RSS focuses on promoting renewable energy solutions and energy conservation. **Eng. Nidal Abdallah,** Manager of the Bio-Energy & Wind Energy Division, specializes in designing and optimizing renewable energy systems, including biogas production systems. He works on developing cost-effective, high-performance energy solutions for solar thermal heating and waste management.

Eng. Omar Saffouri, a Chemical Engineer and Bio-Energy Specialist, leads waste-to-energy projects at the division. He focuses on implementing best practices and transforming waste management solutions into viable business models, advancing biogas technology to enhance efficiency and sustainability.

Performance comparison of a wonderbag and Hay basket as thermal insulating materials for domestic cooking

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Abstract

Thermal insulating materials are very essential in thermal energy storage. There are both internationally and locally produced thermal insulation materials. However, the internationally made thermal insulation materials are expensive compared to the locally made ones due to the high importation cost and taxes imposed on them. This paper aims to compare a wonderbag made in South Africa with a Hay basket (locally made in Uganda) as thermal insulating materials for domestic solar cooking applications. Two identical cooking pots with a capacity of 1 litre each are separately placed on identical Photovoltaic Direct Current (PV DC) cookers inside a wonderbag and Hay basket, respectively. Water heating experiments are performed in the morning, solar noon, and

afternoon. Results show that when a 0.5 kg water load is used, the higher maximum temperature of 96.3 ^{o}C is achieved by the water load in a wonderbag insulator compared to a water temperature of 94.8 ^{o}C in a Hay basket within 24 minutes of the experiments during solar noon. A slightly higher water heating efficiency is shown when in a wonderbag compared to when in a Hay basket. No significant difference in the maximum water load temperatures and heating efficiencies are observed when using a wonderbag and Hay basket as thermal insulating materials for domestic solar cooking applications. The work demonstrates that a cheaply available and locally made heat retention vessel (Hay basket) can substitute the expensive and internationally made/available heat retention vessel (wonderbag).

Keywords: Heat retention, Thermal insulation, Commercial insulation materials, and Local insulation materials

Biography

Dr. Oyirwoth Patrick Abedigamba is a Senior Lecturer, Department of Physics, Kyambogo University (Uganda) and a Honorary Senior Lecturer at North-West University (South Africa), Material Science, Innovation and Modelling (MaSIM) Research Focus Area.
Dr. Abedigamba completed his PhD in Physics at North-West University (South Africa) – 2016. His research interests lie in the area of Solar Physics with emphasis on theoretical and experimental work. He has collaborated widely with researchers in several other disciplines of Physics especially on the aspects of solar cooking and thermal energy storage. E-mail: oyigamba@kyu.ac.ug

Development of a new stand-alone indirect solar dryer for apple slices: Thermal profiling, drying characteristics and quality assessment

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Abstract

Improving the shelf-life of fruits and vegetables, extending their drying time, and preserving their nutritional content remains an enormous challenge in Africa. In response to this problem, a light, stand-alone, low-cost, portable and adaptable indirect solar dryer was fabricated and investigated experimentally using two consecutive 8-hour tests, and a continuous overnight 32-hour test. The dryer requires minimal technical maintenance and operates both in sunny and cloudy conditions. The drying chamber consisted of four metallic trays and 2 DC fans powered by 12 V batteries charged by a 50 W PV panel to remove moisture continuously. The quality assessment of dried fruits was evaluated using pH, colour, and mineral composition measurements. The average solar radiation ranged from 708 to 762 W m^{-2} throughout the experiment tests affecting the drying chamber thermal profiles. A maximum temperature of 63.5° C was recorded in the first tray during day 2 of the 8-hour test, whereas a maximum temperature of 66.5 ° C was reported during the 32-hour continuous test. A minimum moisture level of 18 % n was achieved at 9 hours in the 16-hour tests, while a minimum moisture value of 14 % was obtained for the 32-hour test. A noticeable variation in colour between the fresh and dried fruit slices was observed, whereas a pH< 6.0 suggested the preservation of nutrients and inhibition of the

proliferation of microorganisms. Mineral composition showed that K, Ca, P, and Mg were the most abundant elements in dried apple slices.

Keywords: Portable indirect solar dryer; Apple slices; Drying characteristics; Quality assessment

Biography

Patrick TSOPBOU NGUEAGNI is a Doctor of chemistry in the use of functionalized biogenic materials for wastewater treatment, obtained from the University of Yaoundé I (Cameroon) and Sri Sivasubramaniya Nadar College of Engineering, SSN (India). I have published around 17 research papers, reviews, and book chapters. This research work has significantly contributed to advancing innovative solutions for sustainable resource utilization, energy efficiency, and environmental conservation. My work is now focused on renewable energy, energy storage solutions, and climate resilience strategies. I am currently a postdoc in Materials Science and Innovation Modelling at North-West University in South Africa. Email: nguetsop.ricks@gmail.com

Evaluation of Techno-economic Viability of Solar Water Heating System at MMU Executive Hostels

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Abstract
The use of Electrical heaters in Kenya is getting expensive every day as electricity cost increases. This study seeks to evaluate the economic viability of replacing instant electric water heaters (IEWH) with an evacuated tube collector (ETC) solar water heating (SWH) system at Multimedia University of Kenya (MMU) Executive Hostels, Nairobi, Kenya. Over a one-month period, data on water and electricity consumption, hostel occupancy, and solar radiation was collected to determine the existing hot water demand per person and the associated energy costs. Results indicate that the executive hostel consumes an average of 35.45 Liters of hot water per person daily. With the consolidated cost of electricity being around 0.26 USD cents and estimated energy being 580.4 kWh per day, corresponding to the current costs of electricity stand at USD 4454 per month. The simulation results reveal that the 300-liter ETC system with 30 tubes and an efficiency of 60% can produce approximately 1400 liters of hot water per day, given average solar radiation conditions in Nairobi. The ideal tilt angle for fixed collector was between 0 and 15 degrees. Solar collectors without storage had higher output than the ones with storage. Although the impact of storage on output was insignificant for high storage collectors, the best storage was above 75 liters/m^2. As for the solar fraction, the graph tilted between 60% and 65% translating to 30 collectors. The study findings provide a baseline data for performing a techno-economic viability for installing ETC water heating system at MMU executive hostels.

Keywords: Collector storage; Economic viability; Evacuated tube collector; IEWH; SWH

Biography
Harrison is a Master of Science in Renewable Energy & technology student at Multimedia University of Kenya. He is currently an intern at Renewable Energy Research Consortium (RERC) of the Department of

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Advanced organic materials and technologies for solar photovoltaics

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Abstract

Organic photovoltaics (OPV) is a fast-growing segment of solar photovoltaics nowadays [1, 2]. The main R&D expectations from OPV are related to the prospects of creating more flexible, lightweight and low-cost solar cells [3]. The advantage of OPV is the potential of using inexpensive production technologies such as inkjet printing and roll-to-roll manufacturing [4]. OPV materials can be classified into several categories based on their structure and optoelectronic properties: (i) conjugated polymers (P3HT, polythiophene, polyfluorene); (ii) low molecular organics (e.g., copper phthalocyanine, perylene derivatives); (iii) fullerenes (C60, C70) and its derivatives (e.g., [6,6]-phenyl-C61-butyric acid methyl ester, PCBM); (iv) perovskites (e.g. methyl-ammonium lead iodide, CH3NH3PbI3); (v) dye-sensitized materials (ruthenium, squaraine, rhodamine, porphyrins); (vi) organic-inorganic hybrids (hybrid perovskites like MAPbI3 and nanocomposites). The performance of OPV is determined by the composition of functional donor and acceptor materials. The best PV efficiency (up to 20%) is demonstrated by non-fullerene-based acceptors (NFAs). They form better and more stable structures in the blend with polymer donors, facilitating charge transfer and reducing undesirable phase separation [5]. Carbazole-based acceptors (CBAs) are another important group of materials in the realm of non-fullerene OPV cells. They are attractive due to their unique functional properties, which makes them very promising for improving the performance of OPV [6]. The advantages of CBA materials are as follows: (i) broad absorption spectrum, (ii) good thermal stability, (iii) efficient charge transport, (iv) tunable electronic properties that can be easily modified by introducing different functional groups to control their spectral absorption, energy levels and crystallinity. By carefully adjusting the conjugation length, electron affinity and molecular packing, these materials offer a promising route toward improving the overall efficiency of organic PV cells. Thus, our review confirms the great potential of using advanced organic PV materials and technologies in the nearest future.

Keywords: photovoltaic solar cells, thin-film nanotechnology, organic materials, heterocyclic amines, carbazole derivatives, polymer donor materials, non-fullerene acceptor materials

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Biography

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Functionalization of silicon solar cell back contacts by using carbazole derivatives

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Abstract

The back contacts play an important role in the overall efficiency and performance of solar cells. Functionalization of back contacts can solve problems associated with surface recombination, energy level mismatch and resistance, making it very promising for improving the efficiency of solar cells, especially the injection performance [1]. Functionalization typically involves modifying the backside contact surface to improve the charge injection from the contact surface to the semiconductor. This can be achieved by: (i) passivating the back contact surface with a thin insulating layer or material that reduces surface recombination, (ii) modifying the chemical composition or structure of the surface to create energy levels more favorable for carrier injection, (iii) introducing nanomaterials or thin coatings at the contact interface, e.g., graphene or carbon nanotubes, metallic organic frameworks, chemical doping or alloying of the contact layer, (iv) use of organic or hybrid materials, (v) optimizing the back contact morphology, e.g., creating rough or textured contacts, optimizing the contact geometry; (vi) using chemical vapour deposition (CVD) and atomic layer deposition (ALD) [2-4]. Depending on the nature of chemicals and their solubility, there are a number of deposition methods for surface functionalization, such as spin-coating, drop-casting, sublimation or vapor deposition. Regarding the coating layer thickness, too thick a layer may produce an insulating effect, while too thin a layer may be insufficient to modify the interface. We used thin layers of carbazole derivatives with a thickness of about 70 nm, deposited by spin-coating on Al back contacts to patterned Si(100) n-type substrates with a resistivity of 2.7 Ohm*cm. The morphology of the functionalized surfaces, studied by optical microscopy, have shown fibrous morphology (sample B-58), square-like morphology (sample DB-74) and network-like morphology (samples DB-70, DB-72, DB-73). As a result of the functionalization, the current decrease from three (samples DB-58, DB-74) to ten (samples DB-72, DB-73) times at low bias and even 100 times (sample DB-58) at medium bias in the forward direction. At high bias, the currents are almost the same. This illustrates the functionalization of the interface itself. In the reverse direction, the situation is different: the curves of samples DB-58 and DB-70 are almost identical at low bias, whereas the current of samples DB-72 and DB-73 are ten times lower. Thus, carbazole derivatives can be

effective functional materials for the backside contact functionalization in various PV structures, including silicon solar cells.

Keywords: Si solar cell, Al back contact, carbazole derivatives, self-assembly, functionalization

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Biography

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Techno-Economic Feasibility Analysis of Grid-Connected Solar PV System using Mono-Facial and Bi-Facial Modules in Public Senior High School in Ghana. ‘A Case Study of Presbyterian Boys’ Senior High School’

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Abstract
This study presents a techno-economic analysis of grid-connected solar photovoltaic (PV) systems for public senior high school in Ghana, evaluating both monofacial and bifacial panels to determine their performance and economic and technical viability. The Presbyterian Boys' Senior High School in Accra, Ghana, was used as the case study. The school's daily and monthly energy consumption, along with historical weather data from the project site and PV specifications, were modeled and simulated using PVSYST software version 7.3. The results indicate that the monofacial solar system has an annual energy production capacity of 293 MWh, with a payback period of 7.4 years, a performance ratio of 83.4%, and a levelized cost of electricity (LCOE) of $0.28/ kWh. In contrast, the bifacial system produced 324 MWh annually, with a shorter payback period of 6.9 years, a higher performance ratio of 94.4%, and a lower LCOE of $0.22/ kWh. The study concludes that while both monofacial and bifacial PV systems are technically and economically feasible, the bifacial system offers superior performance and enhanced financial returns, making it a more attractive option for public senior high schools in Ghana. Furthermore, it highlights how factors such as electricity tariffs, emission levies,

and subsidies on PV products significantly impact the economic performance of both PV technologies.

Biography

Emmanuel Kengel Dankwa is an electrical engineer and researcher specializing in renewable energy technologies. He holds a Bachelor of Science in Electrical and Electronics Engineering from the University of Energy and Natural Resources, Sunyani, and a Master of Philosophy in Renewable Energy Technologies from Kwame Nkrumah University of Science and Technology. His research focuses on photovoltaic system optimization, energy efficiency, and sustainable energy solutions, with a strong emphasis on decarbonization and climate change mitigation.

He is passionate about advancing renewable energy solutions and optimizing photovoltaic systems to enhance their efficiency and economic viability. He currently works as an Electrical Planner and Quantity Surveyor at EAC Electrical Solutions Limited, where he is involved in electrical system design, project planning, and cost analysis. Since 2022, he has also been serving as a Sales and Installation Advisor at Solacon Energy Limited, contributing to the deployment of solar energy systems for various applications. Additionally, he is an affiliate teacher at Elite College, where he shares his knowledge and expertise with students, inspiring the next generation of engineers and energy professionals.

Emmanuel is dedicated to promoting sustainable energy solutions that drive the transition to a cleaner and more resilient energy future. His work integrates technical, economic, and environmental perspectives to support the widespread adoption of renewable energy technologies.

Dr. Rahimat Oyiza Yakubu is a wife, mother, and a distinguished researcher/consultant in renewable energy technologies, energy policy, and power system analysis. She holds a PhD in Sustainable Energy Technologies from Kwame Nkrumah University of Science and Technology (KNUST), Ghana, an MEng in Electrical and Electronics Engineering, and a BEng in Electrical and Computer Engineering from the Federal University of Technology, Minna, Nigeria.

With extensive experience in renewable energy systems and project management, Dr. Yakubu has contributed significantly to advancing clean energy solutions. Her research focuses on renewable energy integration, solar PV system wind energy, waste to energy, green hydrogen, and carbon markets. She has worked on numerous projects, including the establishment of a solar PV assembly plant at the National Centre for Energy Research and Development (NCERD), Nsukka, and a barefoot renewable energy college in Nigeria.

Dr. Yakubu's achievements have earned her several accolades, including the L'Oréal-UNESCO For Women in Science Sub-Saharan Africa Young Talent Award and the Vice-Chancellor's Excellence Student Award. She has also received competitive research grants, such as the World Bank KEEP Scholarship and the Utrecht-ANSOLE Sur-Place Grant. Beyond research, she is an active contributor to knowledge dissemination through conference presentations, panel discussions, and mentorship programs. She has served as a judge for renewable energy innovation challenges and participated in global forums on sustainable development. Dr. Rahimat Oyiza Yakubu remains dedicated to advancing Africa's renewable energy transition through innovative research, policy advocacy, and sustainable energy solutions.

Interface Study and Charge Carrier Dynamics in 2D-3D Heterostructured Mixed-Cation Lead Mixed Halide $FA_{0.75}Cs_{0.25}Pb(I_{0.77}Br_{0.23})_3$ Perovskite

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Abstract:
This study establishes that incorporating binary ligands as two-dimensional (2D) perovskite spacer cations significantly enhances the crystallization, morphology, charge-carrier generation, transport, and stability of 2D-3D perovskite films, particularly for a specific mixing ratio of ethylenediammonium diiodide ($EDAI_2$) and *n*-butylammonium iodide (BAI). To investigate the influence of binary cation ratios on the optoelectronic properties and stability of 2D-3D perovskites, films were fabricated using varied cation mixing ratios {(1.5 mg $EDAI_2$ + 0.5 mg BAI), (1 mg $EDAI_2$ + 1 mg BAI), and (0.5 mg $EDAI_2$ + 1.5 mg BAI) in 1 mL isopropanol (IPA)} to functionalize the 2D perovskite layers atop 3D perovskite layers [$FA_{0.75}Cs_{0.25}Pb(I_{0.77}Br_{0.23})_3$] via spin coating. Initial characterization of the films was performed using photoluminescence (PL) spectroscopy, transient photoluminescence (TRPL), ultraviolet-visible (UV-Vis) spectroscopy, and X-ray diffraction (XRD). PL spectroscopy confirmed the successful formation of the 2D perovskite layer for all mixing ratios. Notably, the films with the optimal organic spacer ratio (1 mg $EDAI_2$ + 1 mg BAI) exhibited enhanced photoluminescence quantum efficiencies (PLQE), smooth, pinhole-free morphology (verified through scanning electron microscopy, SEM), and improved crystallinity over a storage period exceeding 1700 hours. Thus, keeping the same deposition parameters, optimal ratio 1:1 gives the best results for PLQE and stability. These results elucidate the critical role of the binary organic cation ligand ratio in influencing the crystallization, passivation, optoelectronic properties, and self-healing effects of 2D/3D perovskite heterostructures.

Biography:

Milimo Amos Nalianya completed B.Ed (Physics major & Mathematics) at Kenyatta University (KU), Kenya and M. Sc in Physics at the School of natural Sciences, Department of Physics of Masinde Muliro University of Science & Technology (MMUST) and, recently, enrolled for PhD in Physics at the same institution. Part of his PhD research work was done at the University of Oxford, Department of Physics, Advanced Functional Materials and devices (AFMD) group under Prof. Moritz Riede in collaboration with prof. Henry Snaith with support from Africa-Oxford initiative (AfOx Scholarship). His PhD thesis is related with Two-dimensional (2D) on Three-dimensional (3D) perovskite semiconductor materials and their application in photovoltaic devices, such as solar cells. He spent more than 6 years in the research and development field. During this time, he was involved in several research projects. Email: amuoso@gmail.com

Impact of front and back contacts on the performances of a-Si:H p-i-n solar cell

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Abstract
Hydrogenated amorphous silicon (a-Si:H) solar cell is simulated by using the unidimensional computer code SCAPS-1D (Solar Cell Capacitance Simulator-1D). The objective of the present contribution is to investigate the influence of the front and back work functions on the performances of (a-Si:H) solar cell. The simulation was done under the illumination of 1000 W/m^2 , at 300 K and an air mass of AM 1.5G. However, the work functions of the front and back contacts were varied from 4.95eV to 5.755eV and from 3.8 eV to 4.8 eV, respectively.The results of the simulation showed that the performances of a-Si:H p-i-n solar cell increase with the front contact work function η =11.8131% for W_{TCO}= 5.755 eV and decrease with the back contact work function η = 5.4835% for W_{FBC} = 4.8 eV.This work shows that the TCO work function strongly affects the solar cell performances. Therefore, it is most important to take the front and back work functions into account in order to achieve the best device performances.

Keywords: *Solar cell, simulation, Conversion efficiency, SCAPS-1D, a-Si:H, Work function.*

Biography

Dr. Manelle HANNACHI obtained her PhD in process and environmental engineering from University of Mohammed El Bachir El Ibrahimi, Bordj Bou Arreridj, Algeria, in 2016. Currently works as a professor at Process Engineering Department, University of Laghouat, Algeria. She is the author and the co-author of 4 international journal publications and 3 international conferences. Her research focuses on renewable energy resource and technologies, photovoltaic systems and materials

The combined effect of thermal treatment and cerium doping on Black Titanium dioxide nanoparticles for perovskite solar cell applications

Tebogo Selema
Sefako Makgatho Health Science University, South Africa.

Abstract
In this paper, cerium-doped black titanium dioxide (Ce-Black-TiO_2) was successfully synthesized through the hydrogenation method and was used to study the structural, morphology, and opto-chemical properties using X-ray diffraction (XRD), Photoluminescence (PL), Ultra-violet Visible spectroscopy (UV-Vis), Fourier transform infrared spectroscopy (FT-IR), Scanning electron microscopy (SEM), Transmittance electron microscopy (TEM), and Energy dispersive Spectroscopy (EDS). Additionally, Ce-Black-TiO_2 was used in the fabrication of perovskite solar cell devices to investigate the combined effect of cerium doping and thermal treatment on the power conversion efficiency (PCE) of the material. The diffraction peaks depicted from XRD showed an improvement in the crystallinity of the material as a result of an increase in annealing temperature. Uv-vis showed an enhancement in the strength of the absorption peak, and also a red-shift as a result of the new electronic states. Band-gap extrapolation revealed a decrease in from 2.89 eV to 2.48 eV, suggesting that the synthesized material can potentially harvest more sunlight. Furthermore, FTIR showed the stretching vibration of the Ti-O-Ti bond in the TiO, the bonding vibration and the stretching vibration of the O-H bond. A clustered/agglomerated structure was depicted by SEM, and finally, solar cell devices were fabricated and an increase in the PCE was observed.

Biography

I go by the name of **Tebogo Selema,** born and bred in a village called Sekgosese situated in the Limpopo province. I did both my primary and secondary levels in the village and later moved to Gauteng to pursue my tertiary education at the Sefako Makgatho Health Science University. This is where I completed my undergraduate degree in BSc Mathematical Science, having majored in mathematics and physics. I then furthered my studies and enrolled for honors in Physics. Upon completion, I further enrolled for a masters programme, and now I am on the verge of completing my MSc (Physics) degree. Throughout my postgraduate studies, I have attended two conferences, namely, collaboration symposium hosted by the university of Witwatersrand and the South African Institute of Physics (SAIP) hosted by the university of Zululand. Email: selematebogo53@gmail.com

Advancing Perovskite Solar Cells: Optimizing TiO_2/Graphene Electron Transport Layers for Enhanced Performance and Future Standardization

Tshegofatso Sewela,
Sefako Makgatho Health Sciences University, South Africa.

Abstract
Perovskite solar cells (PSCs) have emerged as a promising alternative in photovoltaic technology due to their high power conversion efficiency (PCE) and cost-effective fabrication. However, their commercialization remains limited by stability concerns and inefficient charge transport. This study explores the potential of graphene-enhanced titanium dioxide (TiO_2) as an electron transport layer (ETL) to address these challenges. By optimizing the composition of TiO_2/graphene composites, significant improvements in electron mobility, charge collection efficiency, and interfacial stability were achieved. A detailed morphological analysis was conducted to investigate the synergy between anatase TiO_2 and graphene, revealing enhanced structural integrity, reduced recombination losses, and improved charge transport pathways. The results highlight the potential of these hybrid ETLs in boosting PSC efficiency while paving the way for future standardization in next-generation solar cell technologies. Further research will focus on refining synthesis methods, ensuring long-term stability, and developing scalable fabrication techniques for commercial implementation.

Keywords: Perovskite Solar Cells (PSCs), Titanium Dioxide (TiO_2), Graphene, Electron Transport Layer (ETL), Renewable Energy, Stability, Charge Transport, Morphology.

Biography

I am **Tshegofatso Sewela**, an MSc Physics student at Sefako Makgatho Health Sciences University, specializing in renewable energy research with a focus on perovskite solar cells. My research explores the synthesis and characterization of Graphene/TiO_2 composites as an electron transport layer to improve the efficiency and stability of perovskite solar cells. In addition to my academic work, I am a junior data analyst, where I integrate technology with physics to enhance research methodologies and data-driven decision-making.
Beyond my current studies, I have a strong passion for sustainability and green technologies, particularly in advancing renewable energy solutions. My future aspirations

include pursuing an MBA in Environmental Science and Sustainability, and also PhD in physics to bridge the gap between scientific innovation and practical implementation. I aim to contribute to the development of clean energy technologies, with a focus on scalability and accessibility in the Global South. Through research, data-driven insights, and strategic planning, I hope to drive meaningful progress toward a more sustainable energy future. Email: tshegofatsosewela5@gmail.com

Fault Diagnosis in Photovoltaic Systems Using Supervised Machine Learning Models

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Abstract

A critical challenge in large-scale photovoltaic (PV) systems is the failure of solar modules, which can severely impact system efficiency and power output. These failures, necessitate a reliable fault diagnosis tool to ensure optimal performance. The complexity of PV system data has traditionally posed challenges for fault diagnosis, but advancements in machine learning (ML) offer promising solutions. This research investigates fault diagnosis in PV systems using five ML Models and their variants. A 7.5 kW PV system was simulated under various operating conditions, generating a comprehensive dataset used for training and testing the ML Models. Both hold-out and cross-validation methods were employed to validate the models' performance. Results demonstrate that Medium Neural Networks achieved the highest accuracy, with 98.57% during training and 99.59% during testing using hold-out validation. Wide Neural Networks followed closely, achieving 96.30% and 98.39% accuracy for training and testing, respectively, under cross-validation. Among ensemble methods, the bagged tree algorithm yielded 93.73% and 94.06% accuracy for training and testing. These findings underscore the potential of ML Models for accurate and efficient fault diagnosis in PV systems, enhancing system reliability and reducing downtime in real-world applications.

Keywords: Machine learning, Fault diagnosis, Photovoltaic systems, Neural Network, PV faults.

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Biography

Taah Patience Tifuh is a dynamic Electrical and Electronic Engineer dedicated to fostering renewable energy solutions. She holds a Master of Science in Electrical and Electronics Engineering from the National Higher Polytechnic Institute, University of Bamenda. Her research focuses on renewable energy and applications of machine learning. With hands-on experience in designing and installing renewable energy systems, Tifuh has worked on solar lighting, solar-powered pumping, and micro-hydro projects across rural and urban communities.

She was a participant in the African Young Energy Fellowship; she has honed her technical, financial, and leadership skills in clean energy. She is passionate about gender inclusion and she actively supports initiatives that empower women in clean tech.

Tifuh currently serves as an Instructor at the Department of Electrical and Electronic Engineering at the National Higher Polytechnic Institute, University of Bamenda.

Advanced IoT-Based Monitoring System for RealTime Photovoltaic Performance Evaluation: Conception, Development and Experimental Validation

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Abstract

This study examines a developed "Trio-PV System-Monitor," which is an intelligent Internet of Things (IoT)-based device used for monitoring solar photovoltaic (PV) systems. The novel instrument with a data resolution of less than 1 minute is designed to measure six important operating variables of PV systems: irradiance, panel temperature, ambient temperature, humidity, PV current, and voltage. The device has the capability to execute statistical operations on the sample data, enabling real-time monitoring of the PV plant's condition. The device exhibits a high level of adaptability in order to monitor PV plants with a maximum rating of up to 90 kW. The device is equipped with weather-resistant sensors, enabling efficient operation in various weather conditions throughout the year. Moreover, the Internet of Things (IoT) functionality allows for the remote monitoring and data collection of a PV system from any location on the globe. The device has undergone testing on a prototype PV system with a power rating of 30W. The testing took place in Dschang, a location situated in the Western Region of Cameroon. Data was collected over two climatic seasons and the device's various capabilities were presented. One of its notable features is its intuitive user interface, which allows for real-time graphical representation of monitored parameters through a desktop application. This newly developed device is anticipated to function as a comprehensive solution for collecting data from photovoltaic system installations in developing nations, specifically targeting Cameroon. In Cameroon, information regarding PV systems is currently excessively costly and unreliable. The comprehensive findings from a week-long uninterrupted assessment of the PV monitoring device and its applications in harsh environmental conditions demonstrate its reliability and cost-efficiency as a solution for PV system monitoring.

Keywords: Trio- PV system monitor, PV system monitoring, PV parameters, PV data, IoT-based PV system monitoring

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Biography

Njimboh Henry Alombah PhD is an engineer and researcher affiliated with the Department of Electrical and Electronics Engineering at the College of Technology (COLTECH), University of Bamenda, Cameroon. He holds postgraduate diploma in Electronics, Electrotechnics and Control Engineering from the University of Dschang, Cameroon. He is also a master trainer in Solar energy

technologies with training gained from the National Institute of Solar Energy (NISE, Gurugram-India). Dr. Alombah's research interests encompass design and monitoring of PV plants, energy management and audit, nonlinear control, power electronics, optimization algorithms, photovoltaic emulation, PV monitoring, solar energy resources, and solar irradiance estimation. Dr Alombah has published or co-published over 30 articles in reputable journals. He is actively involved in the peer review process and the advancing of scholarly. Alombah has reviewed numerous papers for high-standing academic journals. He heads the department of electrical and electronics engineering of the University of Bamenda. He is a member of the Indian Society of Lighting Engineers (ISLE), an AEE certified energy auditor and a consultant.

Bridging Data Scarcity in Africa: A Novel Synthetic Climatic Model for Machine Learning-Driven Renewable Energy Optimization

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Abstract

Renewable Energy Systems (RESs), such as solar Photovoltaic (PV) systems, are highly dependent on climatic factors like solar irradiance and temperature. However, in many developing regions, particularly in Africa, limited access to high-quality, representative climatic data hinders the deployment of machine learning models for optimization and prediction. To address this challenge, we propose a synthetic data generation model that emulates realistic climatic conditions using sinusoidal patterns and Gaussian noise to capture daily and seasonal variations with real-world fluctuations. This model was employed to train a machine learning framework for predicting the maximum power of a 200 W standalone PV system. With two inputs (irradiance and temperature) and one output (maximum power), the trained model achieved an impressive mean square error (MSE) of 3.1685×10^{-5}. Experimental validation demonstrated a strong correlation between predicted and measured power outputs. Compared to a baseline machine learning model trained on random data, the proposed approach significantly reduced experimental MSE and RMSE, reinforcing its robustness and real-time applicability. This novel synthetic data generation framework addresses the data scarcity challenge in African energy systems, paving the way for more accurate machine learning applications and enhancing the efficiency of renewable energy deployment under dynamic climatic conditions.

Keywords: Renewable Energy Systems (RESs), solar Photovoltaic (PV), Machine learning, Synthetic climatic model

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Biography

Ambe Harrison is an Independent researcher affiliated with the Department of Electrical and Electronics Engineering at the College of Technology (COT), University of Buea, Cameroon. His research focuses on renewable energy systems, with particular emphasis on solar photovoltaic (PV) system optimization, real-time climatic resource estimation, partial shading mitigation, and nonlinear control methodologies. As part of his contributions to the advancement of solar PV energy systems, he pioneers the Fractional Area Theory (FA)—a breakthrough methodology for analyzing and optimizing PV systems under partial shading conditions. His work has provided novel frameworks for MPPT strategies, intelligent control techniques, and real-time emulation of PV systems, making significant strides in improving energy conversion efficiency and system reliability. Harrison has authored over 45 peer-reviewed journal articles in reputable international journals, contributing extensively to the scientific community. He is also a certified international peer reviewer (Elsevier Research Academy) and actively participates in editorial practices, having reviewed manuscripts for over 25 Web of Science-indexed journals. His expertise and contributions to academic publishing extend to his role as a member of the Asian Council of Science Editors (ACSE), where he actively supports editorial initiatives in the Asian region. As an IEEE member, Harrison remains at the forefront of cutting-edge developments in power electronics, intelligent optimization, and renewable energy integration. Beyond academia, he is the founder of the Africa Renewable Energy Hub (AREH), a pioneering initiative dedicated to fostering research, collaboration, and communication in renewable energy development across Africa.

Machine Learning Models for Solar PV power Forecasting: A performance Evaluation

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Abstract
Fossil fuels which constitute the major source of power generation across the globe today, contributes enormously to the emission of greenhouse gases, leading to climate change. The adverse effects of power generation from fossil fuels have led to the development and deployment of renewable energy power systems including solar PV power whose deployment around the world has witnessed a significant increase in the recent years. Solar PV power is dependent on changing weather conditions, which poses a great challenge in managing demand and supply of electrical power. Solar PV power forecasting is essential to guaranteeing better management, of PV systems. Traditionally performed using statistical techniques that are proven to have low accuracy and are less reliable, Machine Learning Techniques have been developed because of their capability to manage large amounts of data and yielding more accurate results. The objective of this research was to evaluate and compare the ability of different machine learning models to forecast PV power PV power in the NW region of Cameroon. Using data from PVGIS, 24 machine learning models were trained and tested. Two performance evaluation metrics; R^2 and RMSE, were used to assess the performance of each model. Among the machine learning models, wide neural network performed better than the other models, yielding a RMSE of 9.377 W and R^2 of 0.999, Thus, wide neural network demonstrated its ability to forecast PV power better than the other machine learning models. This model was then used to perform a short-term solar PV power forecast in Bamenda, North West Region of Cameroon.

Keywords: Fossil fuel, Renewable energy, Solar PV power, Machine learning, Solar PV forecasting.

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Awangum Noel Nkwa is a Cameroonian, who holds Master of Engineering and Master of Science degrees in Electrical and Electronic Engineering from the National Higher Polytechnic Institute of The University of Bamenda. He is passionate about developing engineering solutions to societal challenges, with a strong focus on renewable energy. With extensive experience in solar energy, he has designed and installed numerous photovoltaic (PV) systems, bringing electricity to homes in both rural and urban communities. His research interests align with sustainable energy solutions, and he has published a research article titled “Low-Cost Automated PV Panel Dust Cleaning System for Rural Communities.” Currently, he serves as an Electrical Engineering and Renewable Energy Instructor at The University of Bamenda, where he contributes to academic and technical advancements in renewable energy. Email: noelnkwa@gmail.com

Numerical Study of RbCsFAPbI1-xBr$_x$ Perovskite for Photovoltaic Application by SCAPS-1D

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Abstract

Perovskite solar cells (PSCs) have attracted the attention of researchers owing to their continually increasing power conversion efficiency (PCE). The present research focuses on comprehensive exploration and detailed optimization using various strategies for designing a tandem device using SCAPS-1D. Numerical analysis has been carried out for RbCsFAPbI1-xBr$_x$ using the device architecture of ITO/SnO_2/RbCsFAPbI$_{1-x}$Br$_x$/Spiro-OMeTAD/Au. The thicknesses of the electron transport layer (ETL), hole transport layer (HTL), and absorber layer were varied, also defect density of the photoactive layer was investigated. After optimizing the thickness, defect density, and carrier density, the efficiency of the configuration is increased from 13.01 to 27.40%. The optimal thickness for the electron transport layer was found to be 50 nm for the electron transport layer, 700 nm for the absorber layer, and 100 nm for the hole transport layer (HTL), achieving a power conversion efficiency (PCE) of 27.40%.

Biography

Hello, am **Nancy**. I am a student in Masinde Muliro University of Science and Technology, pursuing a doctorate inPhysics, I completed my master's degree from the same university in the year 2022. I have published the following papers; Obare N, Odari V, Mageto M. Effect of Antimony Concentration on Optical, Electrical and Structural Properties of Copper Antimony Sulphide Thin Films Deposited by Spray Pyrolysis. Iranian Journal of Physics 2022.22(3):1-6. Obare N, Isoe W, Nalianya A, Mageto M, Odari. Numerical study of copper antimony sulphide (CuSbS2) solar cell by SCAPS-1D. Heliyon 10 (2024) e26896.

Currently, I am working under teacher service commission in Kenya and I have also attended conferences and presented the following paper; Obare N. Effect of Substrate Temperature on Optical, Electrical and Structural Properties of Copper Antimony Sulphide Thin Films Deposited by Spray Pyrolysis technique. MSSEESA Conference at Nairobi, Kenya. Obare N. Numerical Study of Chalcostibite Based photovoltaic cell by SCAPS-1D. Kabarack university conference, Nakuru Kenya on July 2022.I am interested in Material for solar energy conversion, Solar Energy modeling, Thin film fabrication, and characterization: Optical, electrical and structural properties for thin films for photovoltaic applications. Email: nancymoraamonantia@gmail.com

Design, Synthesis and Characterization of Conjugated Terpolymers for Photovoltaic Applications

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Abstract

Renewable energy sources hold promise as environmentally benign sources of energy for the sustainability of our ecosystem, since the traditional sources such as fossil fuels have damaged our planet by releasing toxic byproducts; they are now exhausting. Solar energy is one of this kind which is abundantly available and has potential to replace the conventional energy sources. Organic electronics or organic photovoltaics are of great importance in this context due to the possibility of processing organic semiconductors

(conjugated polymers or small molecules) from solution at low temperature, for large area devices, at low cost. Moreover, they can be deposited on flexible plastic substrates and can find convenient applications in products such as organic solar cells (OSCs), organic field effect transistors (OFETs), organic light emitting diodes; with lower cost, flexibility and lighter weight. The most interesting feature of organic electronics is the fine tuning of final properties of device by slight variation in the molecular structure of organic semiconductors. The last four decades have been marked by intensive research in the field of OSCs.

The present research work deals with the design, synthesis and characterization of conjugated terpolymers with enhanced solar light absorption and exhibit appropriate band gap engineering. The structure-property relationship was established. These new polymers were investigated for their performance in organic solar cells.

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Biography:

Dr. Rupali Jadhav-Chavan is currently working as an Assistant Professor in the Department of Chemistry at Dr. Vishwanath karad MIT World Peace University. She is an experienced researcher and academician, Rupali completed her PhD at CSIR- National Chemical Laboratory, Pune. Her research work involves design, synthesis and characterization of conjugated polymers and their applications in organic solar cells. Rupali carried out a part of her research study in TU-Ilmenau, TU-Chemnitz, Germany and Johannes Kepler University Linz, Austria. Her expertise includes synthesis characterization of difunctional monomers for polymer synthesis by metal catalyzed C-C bond formation reactions (Stille coupling, Heck coupling, Suzuki coupling, etc.); synthesis of conjugated copolymers, terpolymers, random and block copolymers using polycondensation, ring opening polymer. Rupali also has hands on experience in fabrication and characterization of solar cell devices. Rupali holds Diploma in Patent law and knows patentability and patent drafting. Email: rupali.chavan@mitwpu.edu.in

Biosynthesis of silver nanoparticles for electrochemical quantification of sunset yellow

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Abstract

Food safety issues have been known to be a threat to socio-economic stability as well as public health. Despite their sensitivity and accuracy, traditional detection techniques often incur high costs, require significant time, and demand considerable labour. Based on this premise, we developed an electrochemical sensor using biosynthesised silver nanoparticles (BAg NPs) obtained from the Vernonia Amygdalina (VA) plant. The morphology of the synthesised nanoparticles was examined using scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The micrographs obtained indicate that the nanoparticles exhibit a spherical morphology and show minimal aggregation. The voltammogram of the modified gold-BAg NPs electrode displayed apparent oxidation and reduction peaks associated with the sunset yellow (SSY) analyte. The modified gold-BAg NPs electrode exhibited significant electrocatalytic activity for SSY detection, achieving a low limit of detection (LOD) of 1.3 × 10^{-3} nM and a limit of

quantification (LOQ) of 6.4 × 10^{-9} nM, utilising the Square Wave Voltammetry (SWV) the technique. Thus, highlighting the enhanced selectivity and stability of the proposed sensor. Hence, the BAg NPs sensor is well-suited for electroanalytical methods for identifying food additives.

Keywords: Vernonia Amygdalina, electrochemical sensor, silver nanoparticles, biosynthesis

Biography

Dr. Hassan Oriyomi Shoyiga is a distinguished researcher and academic who holds a PhD in Chemistry from the University of KwaZulu-Natal (UKZN) in South Africa. His area of expertise is inorganic and materials chemistry. Renewable energy, photovoltaics, flexible electronic devices, materials computation, catalysis, and sensor development constitute his research interests. Dr. Shoyiga has published extensively in high-impact journals, with a focus on graphene-based nanocomposites, electroconductive inks, and smart electronic devices, and has over five years of research experience. Dr. Shoyiga is currently a research fellow at North-West University and Material Science Innovation and Modelling (MaSIM) in South Africa, where he is involved in the synthesis of biomediated nanoparticles for electrochemical sensor applications and the mentoring of graduate students. Additionally, he has delivered presentations at numerous international conferences, garnering recognition such as the Best Poster Presenter award at the RSC 5th Commonwealth Chemistry Posters in 2024. Dr. Shoyiga is a seasoned educator who has taught chemistry and ICT at a variety of institutions and supervised numerous student projects, in addition to his research. He is proficient in computational modelling, advanced instrumentation, and IT tools and is a member of professional organisations such as the South African Chemical Institute (SACI), the Royal Chemical Society (RSC) and the American Chemical Society (ACS).

Electrochemical sensor for the detection of sunset yellow in food using polyaniline/carbon nanopowder nanocomposite modified electrode

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Abstract
Food items frequently face the risk of adulteration resulting in serious health effects. An example of food fraud is the addition of synthetic azo-dye Sunset Yellow for Colouring Food (SY-FCF). This study reports the developed electrochemical sensors for direct detection of sunset yellow at glassy carbon electrodes modified with polyaniline (PANI) and carbon nanopowder (CNP) nanocomposite. The individual components of the sensor and the nanocomposite were characterized with FT-IR, UV-visible, XRD, SEM and TEM. Determine the limit of detection, limit of quantification and percentage recovery of the electrochemical sensors using square wave voltammetry. The electrochemical analysis of sunset yellow (SSY) using a glassy carbon electrode (GCE) modified with a polyaniline/carbon nanoparticle (PANI/CNP) nanocomposite demonstrated optimal detection at approximately 0.8 V. The detection limit for this GCE/PANI/CNP sensor was calculated to be 1.81 nM, with a broad linear detection range spanning from 1 to 194 nM. From the results obtained it is concluded that the designed sensor can be a great tool for detecting sunset yellow in food samples.
Keywords: Electrochemical sensor; food adulterants; sunset yellow; square wave voltammetry; Nanocomposite

Biography

Judith Letsoalo is an emerging researcher in the field of Chemistry, currently pursuing her MSc in Chemistry at North-West University, South Africa where she is also a part of Material Science Innovation and Modelling (MaSIM). Her research focuses on the synthesis, characterization, and application of nano-based materials, particularly for electrochemical sensors in biological and environmental analyses, as well as for wound dressing applications. She has hands-on experience in both chemical and greenmediated synthesis of nanomaterials. Judith has served in various academic support roles, including as a Student Researcher, Lab Assistant, Supplementary Instructor, and Student Assistant at North-West University, where she facilitated study sessions, provided course content clarification, and supported laboratory experiments. She also contributed as a Regional Judge and Mentor for the Eskom Expo for Young Scientist, evaluating science projects from high school students. Her academic journey includes a BSc in Chemistry and Geography and a BSc Honours in Chemistry (with distinction), both from North-West University. Judith has demonstrated exceptional academic performance, earning the Golden Key Certificate as a top 15% high achiever in 2019/20. She is also a published author, with her work on polyaniline/carbon quantum dots nanocomposites featured in Materials Research Express in 2024. She has attended various conferences and workshops, including the 5th International Conference on Nanomaterials, Nanofabrication & Nanocharacterization and Exhibition (NANOMACH 2024) where she presented her paper. She is a member of the South African Chemical Institute (SACI).

49

Development of green and chemical synthesis routes of Au/MWCNT nanocomposites for the voltammetric detection of methylene blue dye in river water samples

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Abstract
This study reports the development of Au/MWCNT nanocomposites for the detection of methylene blue, employing both green and chemical synthesis routes. The synthesized nanomaterials, comprising green synthesized gold nanoparticles (Au_{grn}), chemically synthesized gold nanoparticles (Au_{chm}), and their respective nanocomposites with multiwalled carbon nanotubes (MWCNT), were characterized using a suite of analytical techniques, including scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), UVvisible spectroscopy (UV), and X-ray diffraction (XRD). The XRD analysis revealed particle sizes of 8.69, 21.26, 5.36, 17.09, and 18.73 nm for Au_{grn}, Au_{chm}, MWCNT, Au_{chm}/MWCNT, and Au_{grn}/MWCNT, respectively. The electrochemical properties of the synthesized nanomaterials were investigated using cyclic voltammetry and square-wave voltammetry (SWV). The limits of detection (LOD) and quantification (LOQ) were calculated to be 20.62 nM and 62.51 nM for the Au_{chm}/MWCNT electrode, and 20.23 nM and 61.30 nM for the Au_{grn}/MWCNT electrode, respectively. These results indicate that Au_{grn}/MWCNT exhibits slightly superior sensitivity. The practical applicability of the synthesized electrodes was demonstrated through real-sample analysis, where the recovery percentage for Au_{chm}/MWCNT ranged from 90% to 99% (n = 3), and Ag_{grn}/MWCNT showed a recovery percentage ranging from 97% to 107% (n = 3). The

remarkable recovery rates achieved by both electrodes attest to their dependability and sensitivity in methylene blue detection.

Biography

Mokole Seleke John is a PhD candidate in Chemistry at North-West University (NWU) in South Africa, where he is pursuing research in analytical chemistry with a focus on the development of electrochemical sensors, catalysis, and material science. Currently, Mokole is affiliated with the Material Science Innovation and Modelling (MaSIM) research group at NWU, where he serves as a postgraduate student representative. His research endeavours involve the synthesis of nanomaterials using eco-friendly and chemical methods for applications in electrochemical sensor technology, specifically for the detection of dyes in river water. Mokole has established a notable research trajectory, having published three articles since commencing his Ph.D. journey. Additionally, he has presented his research at various conferences, earning recognition for his outstanding contributions, including the Best Poster Presenter award at the Climate and Weather Symposium held at NWU in December 2024. Beyond his research pursuits, Mokole has accumulated valuable experience as a laboratory assistant at the Chemistry Department since 2021. In this capacity, he has provided instrumental support to undergraduate students, assisting with experiments and fostering a deeper understanding of chemical principles among first-, second-, and final-year students.

Electrochemical evaluation of ethyl acetate extract of Taxus Baccata as corrosion inhibitor for carbon steel in acidic medium.

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Abstract

The aim of this work is the evaluation of ethyl acetate (EAE) obtained from the aerial part of ‘‘Taxus baccata’’ as a corrosion inhibitor for API 5LX60 carbon steel in hydrochloric acid solution (1N) using electrochemical techniques (potentiodynamic polarization, electrochemical impedance spectroscopy, SIE). The SIE plots showed an increase in the size of the impedance spectrum and hence an increase in charge transfer resistance (which is inversely proportional to the corrosion current) according to the increasing inhibitor concentration, proofing the formation of a protective layer. The polarization curves revealed that the EAE acted as a mixed-type (anodic/cathodic) inhibitor. The experimental results show that the EAE is a good corrosion inhibitor, and increasing its

concentration leads to an increase in the corrosion inhibition effectiveness of carbon steel, which reached 82.08% for a concentration of 800 ppm at 20 °C.

Keywords – Ethyl acetate extract; Corrosion inhibition; Plant; Adsorption.

Biography

My name is Karima HANINI, and I am currently a lecturer in chemistry at the University of Echahid Chikh Larbi-Tebessi (Tébessa, Algeria), team leader in the research laboratory of the Laboratory of Active Molecules and Applications (LMBA), member in the laboratory of Applied Chemistry and Renewable Energies (LACRE) located in the same university, and director of a national research project (PNR) entitled Development of Industrial Phosphate for Solar and Thermal Applications. I obtained my Bachelor's degree in exact sciences at the Saadi-sedik high school in Tebessa in 1998. I obtained my graduate diploma in chemistry at Echahid Chikh Larbi-Tebessi University, Tebessa (Algeria) in 2002 and my Magister's degree in materials science at Mohamed Khaider University, Biskra (Algeria) in 2005. I did my PhD in organic chemistry at the University of Tebessa in 2020 and University Habilitation in 2022, working on plant extracts used as corrosion inhibitors and used as additives in electroplating. Email: karima.hanini@univ-tebessa.dz

Electrochemical assessment of the ethanolic extract of an Algerian flora species as an additive in zinc electroplating

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Abstract
Electroplating is an effective method for preventing metal corrosion because it forms a protective layer on the metal surface, enhancing both durability and corrosion resistance. The corrosion resistance of E24-2 carbon steel was tested by coating it with zinc while different concentrations of an ethanolic extract from Algerian plants were added. Potentiodynamic polarization was employed to assess corrosion resistance in a marine environment. The results indicated that adding 1.6 g/L of the ethanolic extract at room temperature during the electroplating process improved the quality of the deposited layer. The layer had strong adhesion, a bright semi-gloss finish, and a thick coating of 11.73 µm. Furthermore, these results showed an inhibitory efficiency of 89.88%, suggesting that the studied additive significantly enhances the corrosion resistance of the coated steel and could potentially substitute conventional corrosion inhibitors.
Keywords – Corrosion; coating; electroplating; additives; inhibitory effectiveness; deposit quality.

Biography

Ghalloussi Hadjer is a PhD Student (3rd year) in Applied Chemistry at Larbi Tebessi University. She had a Master's Degree in Organic Chemistry (2021) and a Bachelor's degree in Nursing. Her research focuses on electrodeposition and nanoparticles, as well as their

effects on the environment. I am particularly interested in their ecological impact and their applications in depollution. Email: hadjer.ghalloussi@univ-tebessa.dz | hadjerghalloussi96@gmail.com

Square Wave Voltammetry Determination of Iron Concentration at Screen Printed Modified- SPEEK-PANI Electrode

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Abstract
The presence and accumulation of heavy metals in water is a severe threat to human health and the environment. In this study, PANI, SPEEK and SPEEK-PANI composite were synthesized and used to fabricate screen printed carbon electrodes-based sensors. Multiple spectroscopic and microscopic techniques were used for the characterization of the nanomaterials; these include Ultravioletvisible spectroscopy (UV/Vis), Fourier transform infrared spectroscopy (FTIR), Xray diffractogram spectroscopy (XRD), Scanning electron microscopy (SEM), and transmission electron microscopy (TEM) and cyclic Voltammetry (CV) were used for the electrochemical characterization of the bare, PANI, SPEEK, SPEEKPANI modified screen printed carbon electrodes. Characterization of the electrodes in 5 mM K $[Fe(CN)_6]$, demonstrated that the PANI modified electrode had a better electron transfer compared to other electrodes due to its polymeric and conducting properties. Square Wave Voltammetry was used to determine the concentration of iron at SPEEK-PANI nanocomposite modified screen printed carbon electrode. An LOD and LOQ of 0.081 µM and 0.245 µM were calculated. This study suggests the use of SPEEK-PANI nanocomposite for iron determination in real sample.

Keywords: SPEEK, PANI, Iron, Screen printed electrode, Square wave voltammetry

Biography

Kabelo Samuel Banda is a passionate and driven young scientist in the field of chemistry, born on November 10, 2000, in Bakenberg, Mokopane, South Africa. Kabelo's academic journey began with his matriculation in 2019 from Bakenberg High School. He then pursued higher education at the North-West University, where he earned a Bachelor of Science degree in Biochemistry and Chemistry (2020-2023). Building on his undergraduate success, Kabelo enrolled in the Bachelor of Science Honours program in Chemistry at North-West University, completing his degree in 2024. Currently, Kabelo is furthering his academic pursuits as a Master of Science in Chemistry candidate at the North-West University, a program he began in 2025 and expects to complete in 2026.
Kabelo's research focuses on the detection of heavy metals in water using Electrochemical sensors. His work aims to develop innovative solutions for monitoring water quality, addressing a critical issue affecting communities worldwide. Throughout his academic career, Kabelo has demonstrated a passion for scientific inquiry, a commitment

to excellence, and a drive to make a positive impact on society. As he continues to advance in his field, he is poised to become a leading expert in environmental chemistry and a champion for sustainable solutions.

International Institute of Refrigeration (IIR) sustainable cooling funded projects

Dr Ina COLOMBO-YOULA
One of the directors of the Association For BME Engineers (AFBE-UK) and the INWIC President-Elect (International Network of Women in Cooling) i.colombo@iifiir.org

Abstract:
Empower in Africa Sustainable Cooling development through innovative projects
The International Institute of Refrigeration is a key consortium partner in many projects. Funded at national, European and international levels, these projects support the IIR's core mission of disseminating knowledge about refrigeration to improve the quality of life in a cost-effective and environmentally sustainable way.
The IIR is currently in involved in 2 EU projects for Africa:
•SophiA enables African countries to pursue sustainable pathways of development through a low-carbon, climate resilient and green growth trajectory, leapfrogging fossil fuels and high global warming potential refrigerant technologies.
•AGRI-COOL aims to empower African rural communities and industries by enhancing food security, reducing waste and fostering economic growth, while contributing to achieve African countries' targets under the Paris Agreement. To achieve this, a containerised solution in which food can be stored and cooled will be sought.
The presentation will focus on the progress and outcomes of the 2 projects.

Biography

Dr Ina COLOMBO-YOULA, graduated from a PhD in Engineering (Carbon Dioxide refrigeration for retail applications), a Master's Degree in Sustainable Energy Systems, Bachelor's Degree in Building Services Engineering from London South Bank University. She has studied also in French where is obtained a Higher Diploma in Thermal Engineering.
She has joined the IIR in 2013 and is in charge of the project management of national, regional and international funded projects. She is the project manager of the EU funded project SophiA and Agri-Cool. She is the secretary of the IIR working group on Cold Chain in Hot Countries and Careers in Refrigeration "CaRe". She is an advocate of the Diversity in Engineering. She is one of the directors of the Association For BME Engineers (AFBE-UK) and the INWIC President-Elect (International Network of Women in Cooling).

Comparison of the Performance of Biodiesel from Jatropha and Castor Oils in an Unmodified Diesel Engine

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Abstract
The use of non-edible oilseeds for biofuel production provides a sustainable alternative to avoid competition with food crops.
This study compares the performance of biodiesels derived from jatropha and castor oils, implementing a technical, economic, and environmental assessment.
Jatropha and castor seeds were harvested from various locations in Cameroon, dried, and processed into oil using hydraulic pressing. The obtained oil yields were 17% and 27%, respectively. Transesterification resulted in biodiesel yields of 79.4% for jatropha and 83.3% for castor. Physico-chemical analyses indicate that jatropha biodiesel (Jb) has a lower acidity (0.53 mg KOH/g) compared to castor biodiesel (4.77 mg KOH/g), a lower iodine index (35.86 gI/100g vs. 45.56 gI/100g), lower viscosity (2.307 mm2/s vs. 6.194 mm2/s), and a higher cetane index (63.15 vs. 58.49). In terms of calorific value, jatropha biodiesel exhibits a higher value (39.91 MJ/kg vs. 38.78 MJ/kg), suggesting better energy potential. Diesel engine tests revealed that jatropha biodiesel generates higher output power than castor biodiesel but remains lower than fossil diesel. The noise measured during biodiesel use was lower than that of diesel, indicating quieter operation. Furthermore, tests showed that jatropha biodiesel produces fewer pollutant emissions than castor biodiesel, making it a more environmentally friendly option.
From an economic perspective, the production cost of 1 L of biodiesel is 725 FCFA for jatropha biodiesel and 1550 FCFA for castor biodiesel, highlighting the better cost-effectiveness of jatropha biodiesel. In conclusion, jatropha biodiesel emerges as a more viable alternative than castor biodiesel due to its engine performance, superior physico-chemical properties, and lower production cost. However, further research is needed to optimize the production process and evaluate gas emissions.

Keywords: Biodiesel, Jatropha, Castor, Yield, Diesel Engine, Energy Performance.

Biography

Young Cameroonian aged 29, **Dr. Nadia Hillary DASSI D**. is a Rural Engineering Engineer, holds a Master's degree in Agricultural Energy and Machinery, and has already obtained her PhD. Besides being the CEO and Co-founder of the startup Power Green, she is the winner of several national and international awards, including the 1st and 5th prize for innovation at the startup week Cati2-Uds 2019, the 2nd national prize at the Youth Entrepreneurship Innovation Challenge UNDP 2019, and the 2nd African prize at the RFI Challenge App. Recently, she was ranked among the 1000 young emerging entrepreneurs of the African continent.
She is not only a successful entrepreneur but also a recognized researcher in the field of agronomic and energy valorization of waste. She has published more than three articles in reputable journals and has also won the Cameroon Biosciences Society 2020 Best Female Presentation Award.

Assessment of Lead Concentration in Surface Soil in the Industrial Area

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Abstract
Lead is a non-essential element, is found in natural conditions in the form of ores on the surface of the earth at low levels. The presence of high lead concentration in the environment is caused by anthropogenic sources. The lead present in the soil under the influence of atmospheric conditions and physico-chemical parameters also can move and contaminate to other parts of the environment such as water, air or vegetation. Object of this study was area around the former Battery Production Factory, Uznove, Berat. The current study reports the verification of lead concentration in top soil samples; distribution of lead concentration at a distance from the factory and Comparison of lead concentration found in the samples with the Maximum Concentration Level (MCL) specified by EEC. Lead is widely used in industry for building construction, lead-acid batteries, bullets, shot, etc. Lead poisoning is an important environmental pollutant that can have life-long adverse health effects. Lead causes symptoms ranging from the loss of neurological function to death depending upon the extent and time of exposure. The main ways of lead exposure in humans and in animals are: food; respiratory process; skin. Aspiration of lead from plants through the root system passes it together with nutrients in plants and to the food chain. We have selected 21 sampling point at a distance 80-600 m around Former Factory Production of Batteries, Berat, Albania. We have collected a total of 21 soil samples. All the representative soil samples were analyzed using Atomic Absorption Spectrometry for their lead content. The lead concentrations found in the analyzed soils were compared with the Maximum Contaminant Levels (MCL) recommended by the Directive 86/278/EEC. Also, is calculated Hazardous Quoted (HQ) for each point sampling. HQ in representative surface soil samples is 0.4 - 80.7 times higher than normal Analysis of this study was performed in the Institute of Applied Nuclear Physics, University of Tirana, Albania.

Key Words: lead, surface soil samples, industrial area, acid batteries, Atomic Absorption Spectrometry (AAS).

Biography

Mirela Alushllari: Mirela is a scientific researcher with extensive expertise in instrumental analytical methods, with a particular focus on the use of atomic emission and absorption techniques for the detection of heavy metals in various fields. Her passion is the development and application of these methods in different scientific studies, including those related to human safety and environmental protection, focusing on the analysis of the impact of heavy metals.
One of her areas of specialization involves the application of non-destructive testing methods based on the ISO 9712 standard, aimed at evaluating the integrity and characteristics of materials. These methods are essential for maintaining the quality of materials used in various industries and for the conservation of cultural heritage objects, as well as for environmental protection.
Her work is focused on developing new analytical methods and supporting scientific research in the area of instrumental techniques. She aims to advance efforts in sustainable development and improve processes and strategies that contribute to the preservation of natural resources and the conservation of cultural heritage.

Mirela holds a PhD in chemistry and works as a lecturer and scientific supervisor for Master's students, contributing to the education and development of future generations of researchers.
In addition to her technical and scientific skills, Mirela is a self-motivated, adaptable, and passionate individual, deeply committed to scientific research. She is also a responsible professional who continuously seeks challenging tasks and responsibilities, looking for opportunities for growth and career advancement as a successful achievement.

Preliminary screening of phytochemicals in a plant species from eastern Algeria

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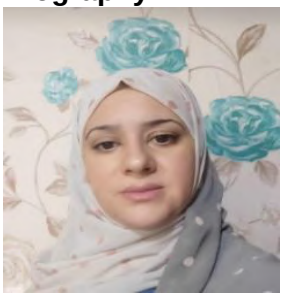
Abstract

Phytochemicals are secondary metabolites known for their therapeutic effects against various human ailments, explaining the traditional use of medicinal plants in disease treatment. These compounds contribute to a plant's color, aroma, and flavor while offering numerous health benefits. Algeria, with its vast territory and diverse climatic conditions, harbors rich flora that serves as an abundant source of medicinal resources. The pharmacological potential of a plant can be assessed through the identification of its phytochemicals. This study aims to develop extraction methods and qualitative techniques for the preliminary screening of phytochemicals in a plant species from eastern Algeria. Aqueous and ethanolic extracts were analyzed using multiple methods to ensure accurate identification. The screening revealed the presence of flavonoids, saponins, tannins, glycosides, phenols, and terpenoids in both leaves and flowers, while anthocyanins, steroids, terpenoids, and alkaloids were detected exclusively in the flowers. Overall, these results highlight the plant's ethnopharmacological potential and emphasize the need for further studies on its isolated active compounds.

Keywords – Phytochemicals, Medicinal plants, Ethnopharmacology, Extraction methods, Secondary metabolites.

Biography



Randa Bayoud is a PhD student specializing in applied chemistry, focusing on natural sources of chemicals, particularly plants, and their applications in corrosion protection and biological activities. Her research aims to explore sustainable and effective natural alternatives to address industrial and environmental challenges. She obtained her diplome, a secondary education teaching certificate, and a qualification certificate for teaching both physics and chemistry from the École Normale Supérieure (ENS) in Kouba in 2013. Since then, she has worked as a high school physics teacher, combining her passion for research and education to bridge the gap between academic knowledge and practical teaching. Beyond her core research, she has also delved into ethnobotanical studies and participated in the ANSOLE conference last year, where she presented a study in this field. Her work reflects a strong interest in integrating traditional knowledge with modern scientific advancements. Through her academic and professional journey, she strives to contribute to the development of sustainable solutions based on natural resources, whether in corrosion protection or biological applications. She is also committed to knowledge dissemination and actively engages in scientific forums to

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Impact of mining iron dust on the phenolic antioxidants, and biological activities of *Atriplex halimus* L.

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Abstract

Mining activities in Eastern Algeria, particularly in Ouenza, release significant iron dust, affecting plant metabolism and ecosystem stability. This study examines the impact of iron dust exposure on *Atriplex halimus* L., comparing samples from Ouenza and Tebessa. HPLC-DAD analysis revealed a decline in p-hydroxybenzoic acid and taxifolin levels, while oxidative stress induced a compensatory increase in antioxidant phenolics. Functional assays demonstrated strong inhibition of AChE, BChE, and α-glucosidase, suggesting therapeutic potential, while α-amylase exhibited minimal interaction. Additionally, the extracts displayed robust antibacterial and antifungal activities, highlighting their bioactive properties in polluted environments. These results underscore the role of *Atriplex halimus* L. in adapting to metal stress and suggest its potential for bioremediation. Understanding plant resilience in contaminated environments contributes to sustainable ecosystem management and pollution mitigation strategies in mining regions.

Keywords – Mining iron dust, Atriplex halimus L.; phenolic antioxidants; antibacterial; antifungal.

Biography

Professor Louiza BOUDIBA obtained a Diploma of Higher Studies in Chemistry in 1995, her Doctorate in 2005 and her Habilitation in 2007. She has been a teacher since 2012, a member of the National People's Assembly from 2012 to 2017 and seconded to the school Normal Superior of Kouba from 2017 to 2020. She was a member of the expert committees (Magister, License, Master and doctoral schools of chemistry), member of national research projects, international programs and supervised several end-of-study projects, Masters, Magisters, and doctorates. Member of ANSOLE (African Network for Solar Energy) since 2012. Her contribution to scientific research has focused on Organic Materials and their Applications (particularly in electrical conduction and renewable energies), Desalination of Seawater and Brackish Water, treatment of wastewater, treatment of waste (particularly plastic waste, and manufacturing of new materials based on waste), Valorization of synthetic and natural bioactive molecules in several biological and environmental fields.

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Extraction and characterisation of Hibiscus acetosella leaves' dye and its application to cotton and polyester fabrics using mordants

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Abstract

Colour significantly improves the environment in which we live. Dyes are compounds that add colour to objects by absorbing and emitting light only in certain wavelengths. It is estimated that 7×10^7 tonnes of synthetic dyes, which are thought to persistent pollutants, are produced and used annually. Natural dyes are generally non-toxic, non-allergenic and generated wastewater can be treated by biodegradation. The *Hibiscus acetosella* plant belongs to the Malvaceae family and genus Hibiscus, which has over 200 species. This plant is a potential source of natural dyes. It contains anthocyanins responsible for the pink, red, blue and purple colours in parts of the plant. Synthetic dyes have been in existence, extensively used in several industries, poisonous and potentially carcinogenic and mutagenic. They lead to water pollution, increased BOD and COD levels. In this research, *H. acetosella* leaf samples were collected from Kisii County, Kenya and *Eucalyptus globulus* bark samples from Dedan Kimathi University of Technology farm. The extraction was carried out upon sample preparation. The 80%, 100% cotton and 100% polyester fabrics were obtained from Gakwanja Uniforms, Nyeri Town. The dye and tannins were characterised using chemical tests. Physical tests such as LC-MS, GC-MS and FT-IR were carried out on the dye. The yield of the dye obtained using cold extraction method (80% ethanol and 0.1% HCl) was 65.44 ± 1.53 mg/g. The main anthocyanin found in *H. acetosella* leaves was Cyanidin-3-O-glucoside which eluted at a retention time 22.52 min and with an *m/z* at 449.0. Besides, some non-polar compounds present were recorded based on the GC-MS data obtained. The fabrics of the size 100 mm × 40 mm were dyed and their colour fastness was carried out as per the ISO 105-CO3 method. The present study provides reliable information on dye extraction, stabilisation, percentage yield, phytochemical constituents and dyeing suitability of *H. acetosella* leaves.

Biography

Bernard Wambua Makau is a committed scientist and chemist who has demonstrated both academic achievement and scientific expertise in both industrial and research settings. Bernard graduated from Dedan Kimathi University of Technology (DeKUT) with a First-Class honours in Industrial Chemistry. He has completed an internship program in Sustainability and Plastics Management at Johannes Kepler University Linz (JKU), Austria and he is finishing a Master of Science in Chemistry at DeKUT. He performs a variety of responsibilities as a Graduate Assistant at DeKUT, including supervising lab work, undertaking research, and conducting tutorials. During his internships at Highlands Drinks Ltd. and New Kenya Cooperative Creameries, he gained skills in chemical analysis and quality control and while in JKU, he gained exemplary skills in polymer processing, analysis, structures and properties.

Beyond his responsibilities at work and school, Bernard devotes his enthusiasm to research in materials chemistry, polymer science, and electrochemistry. As vice secretary of the DeKUT Catholic Chaplaincy Alumni Association, Bernard leads the group and focuses his efforts on charity and environmental conservation.
Bernard will significantly advance chemical sciences and sustainable development with his commitment to laboratory experience, analytical skills, and innovative strategies.

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Authorship

This document was compiled by Daniel Ayuk Mbi Egbe with assistance from Nnenna Veronica Ebem.
The abstract and biography of Prof Woo Kyong Kim was written by Daniel A. M. Egbe based on information from the internet (https://www.wcpec9-korea.com).
The abstract about WAITRO was written by Daniel A. M. Egbe based on information from the internet (waitro.org) and from Prof. Paul Burrows. The bio of Prof. Paul Burrows was written by Nnenna Veronica Ebem and edited by Daniel A. M. Egbe using information from LinkedIn.

Acknowledgements

The practical support of the following persons in the preparation of this event is acknowledged:
-Prof. Paul Burrows, Secretary General of WAITRO, Jitri, Nanjing, China
-Prof. Ashmore Mawire, MaSIM, North-West University, Mahikeng Campus, South Africa
-Ms Lei Hou (Holly), Communication Officer, WAITRO Office, China
-Mr Vidvuds Beldavs, Riga Photonics Centre, Riga, Latvia
-Ms Nnenna Veronica Ebem, International Relations, ANSOLE e.V. , Jena, Germany

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