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Engineering & Scientific Consulting

Lenin Wung Kum, Ph.D.

Associate | Electrical Engineering and Computer Science

Phoenix

+1-623-587-4152 | lwkum@exponent.com

Professional Profile

Dr. Lenin Wung Kum expertise and training is in electrical, electronics and energy storage systems with specialties in next generation lithium-ion batteries for both liquid and all solid-state battery chemistries. His expertise ranges from battery materials processing, battery cell fabrication, performance evaluation and failure testing to applying a wide range of characterization tools/techniques to understand the performance and failure mechanisms. He has strong in-depth experience (experimental, practical and research) in investigating and diagnosing battery degradation mechanisms at the electrochemical, structural and performance fading level.

Dr. Lenin has an extended expertise in battery/cell and material characterization techniques which includes but not limited to, scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), Raman spectroscopy, differential scanning calorimetry (DSC), energy dispersive X-ray spectroscopy (EDS or EDX) spectra and elemental mapping, electrochemical impedance spectroscopy (EIS), thermogravimetric-mass spectrometry (TGA-MS), cyclic voltammetry (VC) and photoelectron spectroscopy techniques. He also has hands-on experience in thin film coating.

Before Dr. Lenin Wung Kum joined exponent, his research work and focus were on improving the electrochemical performance and safety of lithium-ion batteries via cathode surface engineering where he investigated the root cause of lithium-ion battery safety issues, cathode electrolyte interface (CEI) resistance, solid electrolyte interface (SEI) resistive thickness, lithium dendrite growth, cathode material structural damage and transition metal dissolution, and then developed and synthesized novel thin film ceramic materials and coating technique to mitigate their severity. His research work helped to improve the cycle life, rate capability, cathode structural integrity, thermal stability, and safety of lithium-ion batteries, resulting in reduction of interfacial resistance growth and hence voltage polarization effects. Dr. Lenin also has research and experimental experience on alkaline silver oxide zinc (AgO₂-Zn) batteries, and the fabrication and characterization of gas sensors

Academic Credentials & Professional Honors

Ph.D., Electrical Engineering, University of Dayton, 2023

M.Sc., Electrical and Electronics Engineering, Islamic University of Technology (IUT), 2012

B.Sc., Electrical and Electronics Engineering, Islamic University of Technology (IUT), 2010

University of Dayton (UD) PhD Graduate (Research and Teaching) Assistantship Award, 2018-2023

Cameroon Government joint OIC (Organization of Islamic Cooperation) Scholarship, 2007-2012

Certificate of Recognition for Outstanding Academic Record, 2010

Korean Government Scholarship, 2012

Professional Affiliations

IEEE (The Institute of Electrical and Electronics Engineers)

ECS (The Electrochemical Society)

ACS (American Chemical Society)

NSBE (National Society of Black Engineers)

Publications

Lenin W. Kum, Nick Vallo, Deependra Kumar Singh, Jitendra Kumar. Precise Cathode Interfacial Engineering for Enhanced Electrochemical and Thermal Stability of Lithium-Ion Batteries. *Journal of American Chemical Society Applied Energy Materials* 2023, 6, 5, 2999–3009.

Tongjie Liu, Lenin W. Kum, Deependra Kumar Singh, Jitendra Kumar. Thermal, Electrical, and Environmental Safeties of Sulfide Electrolyte-based All-Solid-State Li-ion Battery. *Journal of American Chemical Society OMEGA* 2023, 3, 3

Akash Kota, Lenin W. Kum, Kavya Vallurupalli, Ashish Gogia, Amy T. Neidhard-Doll, Vamsy P. Chodavarapu. Highly Flexible Stencil Printed Alkaline Ag₂O-Zn Battery for Wearable Electronics. *Journal of MDPI Batteries* 2022, 8, 74

Lenin W. Kum, Ashish Gogia, Nick Vallo, Deependra Kumar Singh, and Jitendra Kumar. Enhancing Electrochemical Performances of Rechargeable Lithium-Ion Batteries via Cathode Interfacial Engineering. *Journal of American Chemical Society Applied Materials and Interfaces* 2022, 14, 3, 4100–4110.

Lenin Wung Kum, Ashish Gogia, Nick Vallo and Jitendra Kumar. Cathode Surface Engineering with Ceramic Solid Electrolytes for Lithium-Ion Batteries Performance Enhancement. *Journal of The Electrochemical Society* 2021 Meet. Abstr. MA2021-02 1810.

Birhanu Alemayehu, Akash Kota, Lenin Wung Kum, Amy T. Neidhard-Doll, Vamsy Chodavarapu, and Guru Subramanyam. Fabrication and Characterization of PVA/PEO/CB Nanocomposite Films. *Journal of MDPI Materials* 2021, 3.

Lenin Wung Kum, and Mohammad Rakibul Islam. Complete Leakage Probability in Fading Channels with the Effect of Artificial Noise. *Journal of IEEE* 978-1-4673-1436-7/12/2012.

Presentations

Lenin Wung Kum, Ashish Gogia, Nick Vallo and Jitendra Kumar. Cathode Surface Engineering with Ceramic Solid Electrolytes for Lithium-Ion Batteries Performance Enhancement. Poster presentation, *Journal of The Electrochemical Society*, 240th ECS meeting, Orlando, FL, 2021.