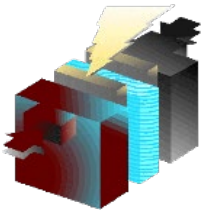

Journal of New Materials for Electrochemical Systems

Special issue, July 2027

Journal homepage: https://www.newmaterials.ca/

CALL FOR PAPERS

Title of the special issue:

Machine Learning Approaches for Charge–Discharge Modelling and Intelligent Management of Electrochemical Storage in Smart Grids

Guest editors:

Dr. Dirman Hanafi Burhannuddin (MGE)

Universiti Tun Hussein Onn Malaysia (UTHM)

Malaysia.

Email-ID: diranafburdin2412@yahoo.com

Google Scholar link:

https://scholar.google.com/citations?user=Pc_Xf3UAAAAJ&hl=en

Dr. Ahmad Fateh Bin Mohamad Nor (CGE)

Universiti Tun Hussein Onn Malaysia (UTHM)

Malaysia.

Email-ID: afateh@uthm.edu.my

Google Scholar Link:

https://scholar.google.com.my/citations?user=pp6HDQMAAAAJ&hl=en

Dr. Yudhi Gunardi (CGE)

Mercu Buana University

Indonesia.

Email-ID: yudhi.gunardi@mercubuana.ac.id

Google scholar Link: https://scholar.google.co.id/citations?user=Zlx3-_4AAAAJ&hl=id

Description:

Electrochemical storage systems have become an essential component in smart grid environments as their charge retention capability, cycling stability and energy transfer characteristics strongly influence the reliability of renewable power integration. Machine Learning (ML) methods provide an effective framework for analysing charge and discharge behaviour under varying thermal conditions, fluctuating current density and dynamic loading environments. Intelligent data driven models support accurate estimation of state of charge, state of health and degradation behaviour in advanced batteries and electrochemical supercapacitors used in integrated energy systems. Learning-based approaches help enhance electrochemical parameter determination and performance assessment of materials by continuously tracking changes in voltage levels, ion diffusion behavior and the properties of electrodes. Predictive learning-based approaches also aid in improving energy storage capacity by preventing loss of capacity and ensuring durability throughout cyclic operations. Such computational techniques support the development of highly responsive electrochemical storage management platforms for smart grid applications, complex renewable energy integration and distributed storage operating conditions.

Intelligent management of electrochemical storage systems requires precise interpretation of nonlinear electrochemical behaviour associated with charging dynamics, discharge recovery and material aging processes in smart grid infrastructures. The use of ML techniques allows for the continuous assessment of electrochemical performance by identifying anomalous voltage profiles, internal resistance changes and thermal instabilities in electrochemical reactions during the storage process. ML models trained on electrochemical performance data can be used to ensure proper energy flow in distributed energy storage devices, thereby ensuring stable system operations within a renewable energy-integrated grid network. ML models also help optimize the usage of electrodes, cycle life extension and energy conversion efficiency within battery and supercapacitor systems operating under non-linear load conditions. Furthermore, data-driven control schemes improve durability

testing, fault detection and scheduling operations within electrochemical storage systems by accurately modeling electrochemical reaction properties.

This special issue welcomes research addressing ML driven charge and discharge modelling, electrochemical storage analysis and management strategies for smart grid environments. Contributions focusing on advanced batteries, electrochemical supercapacitors, storage durability, electrochemical reaction modelling, diagnostics, fault identification and energy storage control are particularly encouraged. The issue also seeks research involving data driven optimization of distributed electrochemical storage systems under operating conditions and renewable energy integration. Both theoretical developments and practical implementations related to electrochemical storage performance and smart grid applications are encouraged.

List of Topics:

- Machine Learning Models for Electrochemical Battery Charge Discharge Behaviour Analysis
- Intelligent Electrochemical Supercapacitor Performance Optimization Using Machine Learning Frameworks
- Data Driven State of Health Prediction in Electrochemical Storage Systems
- Machine Learning Assisted Thermal Stability Monitoring in Electrochemical Energy Storage
- Predictive Electrochemical Degradation Assessment for Smart Grid Battery Management Applications
- Intelligent Fault Diagnosis Methods for Electrochemical Supercapacitor Storage Networks
- Adaptive Machine Learning Frameworks for Electrochemical Storage Durability Enhancement Applications
- Electrochemical Reaction Behaviour Modelling Using Intelligent Data Driven Learning Techniques
- Machine Learning Approaches for Electrochemical Storage Voltage Profile Prediction Applications
- Intelligent Electrode Behaviour Characterization in Advanced Electrochemical Storage Systems
- Machine Learning Based Ion Diffusion Prediction in Electrochemical Storage Materials
- Electrochemical Storage Capacity Loss Prediction Using Machine Learning Algorithms

You can send directly your manuscript to the guest editor:

Lead Guest Editors: Dr. Dirman Hanafi Burhannuddin
Email-ID: diranafburdin2412@yahoo.com

Or,

To: JNMES@polymtl.ca

The submitted manuscripts should not have been previously published, nor should they be currently under consideration for publication elsewhere.

Important Dates:

- Manuscript submissions due : 27 November, 2026
- First round of reviews completed : 20 January, 2027
- Revised manuscripts due : 20 March, 2027
- Final manuscripts due : 10 May, 2027