



Name of the keynote speaker: Karim Zaghbi
Affiliation: Concordia University, Canada

Short Biography

Karim Zaghbi is a world-renowned scientist specializing in electrochemistry, rechargeable batteries (lithium-ion and solid-state), carbon, energy transition and transportation electrification. Following a 28-year career at Hydro-Québec, he became Professor of Chemical and Materials Engineering at Concordia University, the CEO of CFREF funded initiative of Volt-Age, and Director of Collaborating Centres on Energy and Energy Transition.

As General Manager of materials development research for lithium-ion batteries at Hydro-Québec, he led the company to become the world's first to use lithium iron phosphate (LFP) in cathodes and to develop natural graphite and nanotitanate anodes, technologies used by Tesla, Ford, Mercedes, BMW, Bolloré, CAT and BYD etc. Prof. Zaghbi developed the first dual-electrode photobattery and high MWh energy storage system based on LFP/graphite through a joint venture with Sony and Hydro-Québec. He has also made significant contributions to electrothermics, ionic liquids, and molten salts. His team's latest advancements, in collaboration with universities, research centers, and companies, are pioneering the next generation of electric vehicle batteries and energy storage solutions, positioning Québec and Canada as leaders in this field.

Prof. Zaghbi co-author of 546 publications, 1070 patents and 62 licenses. His H-index is 91 with 28397 citations. He is a Fellow of the Electrochemical Society (2011), the Canadian Academy of Engineering (2017), the Royal Society of Canada (2021), and the Royal Society of Chemistry (2023). He is the only person to have received both the Research Award (2010) and the Technology Award (2017) from the International Battery Association. Among his many honors, he received the Prix du Québec Lionel-Boulet (2019), the highest distinction for industrial and applied research

and development awarded by the Government of Québec, and the Kalev-Pugi Award from the Society of Chemical Industry Canada (2022). He was named Personality of the Year for 2023 by L'Actualité Magazine.

Title of the keynote talk: Nano-olives as cathode for Li-ion batteries for EV and energy storage: from Idea to market

Abstract of the keynote talk

We present the history of nano LiFePO₄ (LFP) and nano LiMn_xFe_{1-x}PO₄ (x=0.1–1) (LMFP)-based lithium-ion batteries (LIBs), with a primary focus on their applications in electric vehicles (EVs) and energy storage, from the initial concept to market introduction. Despite numerous individual research studies, a unified and comprehensive review covering the subject from resource extraction to vehicle integration has not yet been offered. Accordingly, our review encompasses the entire LIB development process:

1. Initial Resources: This includes lithium, iron, manganese, and phosphorus; their global reserves; mining procedures; and the demand for LIB production.
- Fe- and Mn-Containing Precursors: We discuss the main precursors, such as Fe₀, Fe_xO_y, FePO₄, FeSO₄, and MnSO₄, focusing on their preparation methods, their use in LIBs, and their effect on the electrochemical performance of the final active cathode materials.
2. Synthesis of Active Cathode Materials: We examine the use of these precursors in the synthesis of active cathode materials, highlighting pioneering methods for olivine production, particularly hydrothermal liquid-state synthesis, molten-state synthesis, and solid-state synthesis.
3. Electrode Engineering: This section covers the design and optimization of electrodes and electrolytes.
4. Cell, Module, and Pack Production: We delve into the production processes of cells, modules, and battery packs.
5. Challenges and Opportunities: We highlight the challenges associated with the widespread utilization of olivines in LIBs, focusing on safety, cost, energy efficiency, and carbon emissions.

In conclusion, our review provides a comprehensive overview of the entire process involved in the fabrication of LFP/LMFP-based LIBs, from the extraction of raw materials to recycling and the circular economy.