

In-situ Polymerized Single Lithium-ion Conducting Binder as an Integrated Strategy for High Voltage LNMO Electrodes



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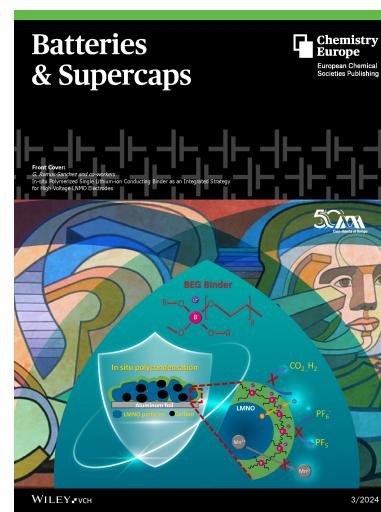
Invited for this month's cover picture is the Electrochemical Energy laboratory at Universidad Autónoma Metropolitana Iztapalapa in Mexico City in collaboration with ESIQIE IPN and ESFM IPN. The front cover displays a schematic representation of the in-situ preparation of the electrode using single-ion-conductive binders; this process results in reduced degradation of both the LMNO electrode and electrolyte. In the background, there is an image of the landmark mural entitled "Death of Ignorance and Transformation of Society" by A. Belkin, located at the premises of UAM-I, the institute where the primary research was conducted. The mural picture and logos are used with the permission of UAM president. The graphic composition is credited to D.G. Liliana Hidalgo Sánchez de Tagle. Read the full text of the Research Article at 10.1002/batt.202300383.

What is the most significant result of this study?

The study's foremost achievement lies in the exclusive use of a binder exhibiting single Li^+ conduction properties, thereby fully replacing the conventional PVDF binder. This strategic substitution notably mitigated the occurrence of side reactions at the electrode-electrolyte interface, particularly in the context of the LNMO electrode, during higher voltage conditions. Beyond these distinctive properties, the electrode formation via in situ polymerization directly onto the current collector profoundly impacts the cost and sustainability aspects of the electrode manufacturing process.

What prompted you to investigate this topic/problem?

Polymer electrolytes have investigated in our group for a long time. In this work, we opted to leverage alternative properties. Notably, the nearly perfect Li^+ transport number inherent in



these electrolytes mitigates the presence of PF_6^- in proximity to the electrode surface, thereby averting side reactions that could otherwise induce deleterious reactivity at higher potentials.

How did the collaboration on this project start?

The inception of collaborative efforts on this project dates back to the establishment of the Electrochemical Energy Laboratory at UAM-I. A primary objective of this laboratory has been to contribute to the development of Mexican technology through collaborative initiatives. Furthermore, the motivation to devise *in situ* and *in-operando* techniques for battery characterization, particularly the quantification of gaseous species and dissolved ions within the electrolyte, propelled the initiation of this collaborative venture.

How did each team member/collaborator contribute to the work?

The development of polymer electrolytes was undertaken in the Chemistry Department, while the NMR laboratory played a pivotal role in characterizing various species. Electrochemical and spectroscopic analyses were conducted in the IPH department at UAM-I. Notably, DEMS analysis took place at ESIQIE IPN, and EPR experiments were conducted at ESF-IPN, contributing valuable insights to the comprehensive research endeavor.