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Review on the Experimental Characterization of Fracture in Active Material for Lithium-Ion Batteries

by Francesca Pistorio ^{*}† , Davide Clerici [†] , Francesco Mocera  and Aurelio Somà 

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Abstract

Nowadays, lithium-ion batteries are one of the most widespread energy storage systems, being extensively employed in a large variety of applications. A significant effort has been made to develop advanced materials and manufacturing processes with the aim of increasing batteries performance and preserving nominal properties with cycling. Nevertheless, mechanical degradation is still a significant damaging mechanism and the main cause of capacity fade and power loss. Lithium ions are inserted and extracted into the lattice structure of active materials during battery operation, causing the deformation of the crystalline lattice itself. Strain mismatches within the different areas of the active material caused by the inhomogeneous lithium-ions concentration induce mechanical stresses, leading ultimately to fracture, fatigue issues, and performance decay. Therefore, a deep understanding of



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Sabine Paarmann , Kathrin Schuld, Thomas Wetzel 

First published: 09 August 2022 | <https://doi.org/10.1002/ente.202200384> | Citations: 3

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Nanoscale Nucleation and Growth of Electrodeposited Lithium Metal

Author: Allen Pei, Guangyuan Zheng, Feifei Shi, et al

Publication: Nano Letters

Publisher: American Chemical Society

Date: Feb 1, 2017

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Mini-Review

Journal of Electrochemical Science and Technology 2022;13(1):19-31.

Published online: October 18, 2021

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Principles and Applications of Galvanostatic Intermittent Titration Technique for Lithium-ion Batteries

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REVIEW | March 8, 2023

Electrochemical Impedance Spectroscopy—A Tutorial

Alexandros Ch. Lazanas, and Mamas I. Prodromidis*

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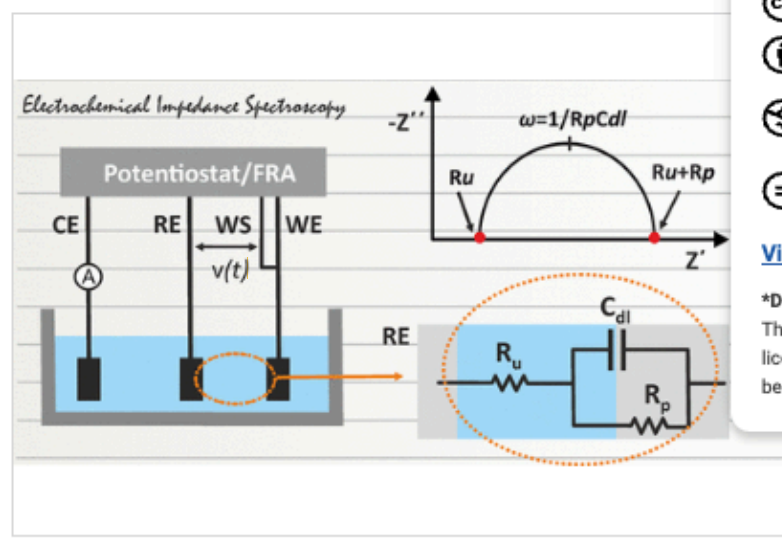
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 Published March 8, 2023
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Abstract

This tutorial provides the theoretical background, the principles, and applications of Electrochemical Impedance Spectroscopy (EIS) in various research and technological sectors. The text has been organized in 17 sections starting with basic knowledge on sinusoidal signals, complex numbers, phasor notation, and transfer functions, continuing with the definition of impedance in electrical circuits, the principles of EIS, the validation of the



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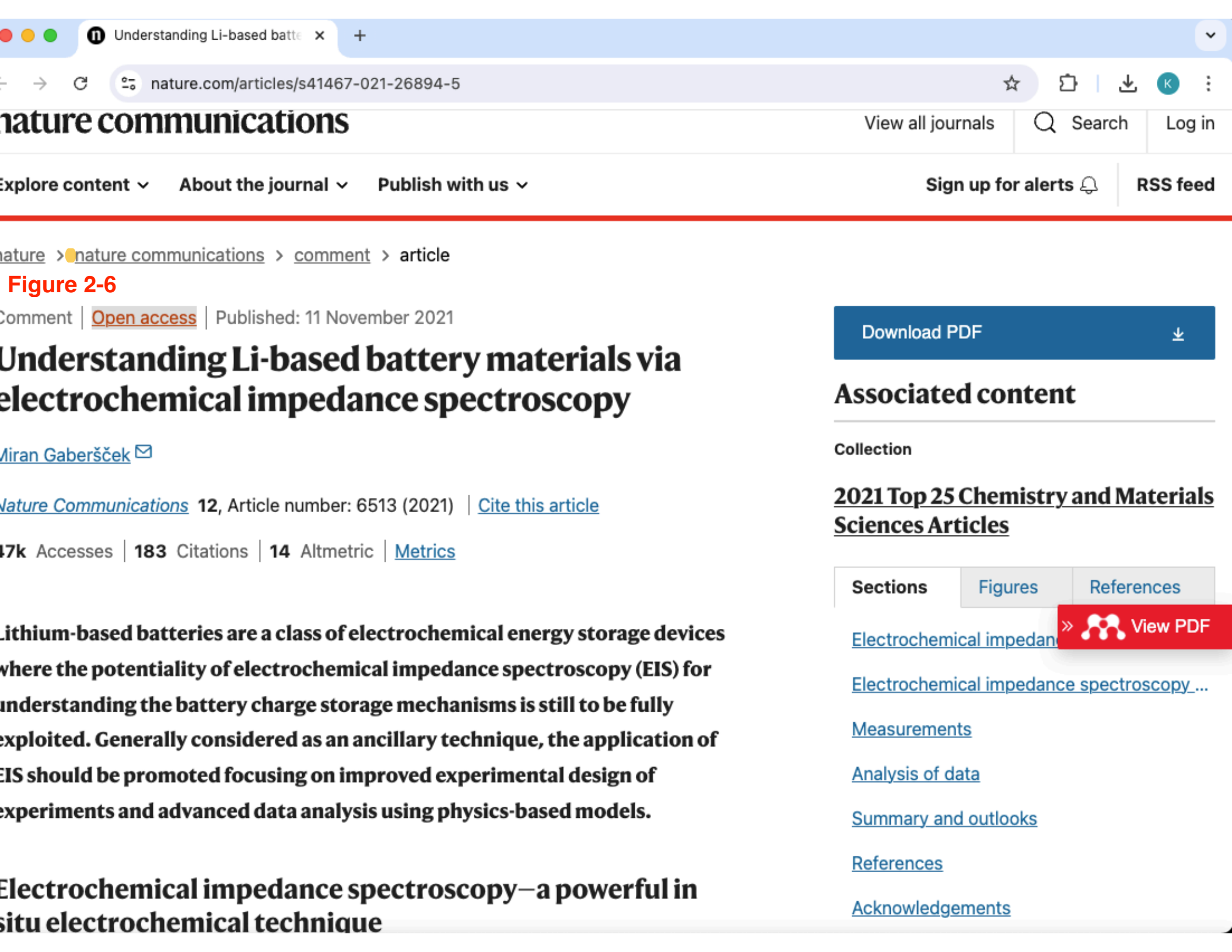


Figure 2-6

Comment | Open access | Published: 11 November 2021

Understanding Li-based battery materials via electrochemical impedance spectroscopy

Miran Gaberšček

Nature Communications 12, Article number: 6513 (2021) | Cite this article

17k Accesses | 183 Citations | 14 Altmetric | Metrics

Lithium-based batteries are a class of electrochemical energy storage devices where the potentiality of electrochemical impedance spectroscopy (EIS) for understanding the battery charge storage mechanisms is still to be fully exploited. Generally considered as an ancillary technique, the application of EIS should be promoted focusing on improved experimental design of experiments and advanced data analysis using physics-based models.

Electrochemical impedance spectroscopy—a powerful in situ electrochemical technique

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Book: Electrochemical Methods: Fundamentals and Applications, 2nd Edition
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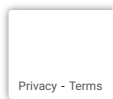


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Fundamentals of Scanning Electron Microscopy (SEM)

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Publication: Springer eBook

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