



# Lithium battery delithiation

Orthorhombic  $\text{LiFePO}_4$  (LFP) offers highly reversible redox reactions, making it an attractive cathodic material for lithium-ion batteries. This electrochemical property was exploited to develop an environmentally benign selective lithium extraction process based on  $\text{CO}_2$  and hydrogen peroxide that can be applied to direct LFP recycling. The proof of concept ...

This knowledge can guide us on the right path to the successful utilization of Si anodes. For instance, it is suggested to limit the cutoff potential above the crystallization of a-Li ...

The capacity-fading mechanism for commercialized Ni-rich cathodes is largely unclear. Here, Yu et al. observe the dynamic lattice-collapse process in Ni-rich cathode during delithiation through in situ transmission electron microscopy. On the basis of these observations, they propose a "layer-by-layer delithiation" mechanism as the origin of mechanical instability ...

A first principle method, based on the density functional theory, was used to investigate the average voltage of lithiation/delithiation for Li-ion battery materials across 7 categories and 18 series, including  $\text{LiMO}_2$ ,  $\text{LiMn}_2\text{O}_4$ ,  $\text{LiMPO}_4$ ,  $\text{Li}_2\text{MSiO}_4$  and graphite. The average voltage of lithiation/delithiation in the relevant electrode materials was obtained by ...

Low voltage anode materials for lithium-ion batteries. Ali Eftekhari, in *Energy Storage Materials*, 2017. 16 Classification. It should be taken into account that the anode process is delithiation when using a battery, regardless of labeling. Therefore, the delithiation should be conducted at a less positive potential as much as possible.

Rechargeable lithium (Li)-ion batteries at present dominate the portable electronics market and exhibit great potential for electric vehicles, grid-scale energy storage and renewable energy ...

The world is moving towards electrification as  $\text{CO}_2$  emission standards have resulted in a growing battery market. Rechargeable lithium ion batteries (LIBs) have been widely used as a power source ...

Rechargeable batteries are indispensable devices in modern society and they are continuously improved toward higher energy density and longer lifetime 1,2 lithium-ion batteries (LIBs) as a ...

first principle, Li-ion batteries, average voltage of lithiation/delithiation Citation: Zhu X H, Chen N, Lian F, et al. First principle calculation of lithiation/delithiation voltage in Li-ion battery materials. *Chinese Sci Bull*, 2011, 56: 3229-3232, doi: 10.1007/s11434-011-4705-7 Since the development of the lithium-ion (Li-ion) battery by

Graphite is the traditional anode material for lithium ion batteries (LIBs) owing to its excellent cycling performance and low delithiation voltage plateau. However, as for LIBs, the improvement of energy density is



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limited by the capacity below voltage plateau of graphite. Moreover, the enhancement of fast charging performance is also a major challenge for graphite ...

An operando bimodal atomic force microscopy system was constructed to perform nanomechanical mapping of an amorphous Si thin film electrode deposited on a  $\text{Li}_6.6\text{La}_3\text{Zr}_{1.6}\text{Ta}_{0.4}\text{O}_{12}$  solid electrolyte sheet during electrochemical lithiation/delithiation. The evolution of Young's modulus maps of the Si electrode was successfully tracked as a function ...

The cycling of the battery was done by using a constant-current-constant-voltage process. The battery was charged to 4.2 V versus  $\text{Li}/\text{Li}^+$  with a constant current density of  $50 \text{ mA cm}^{-2}$  and then held at 4.2 V versus  $\text{Li}/\text{Li}^+$  until the current dropped to  $10 \text{ mA cm}^{-2}$ .

Stallard, J.C. et al. Mechanical properties of cathode materials for lithium-ion batteries. *Joule* 984-1007 (2022)  
Zhao, X. et al. Design principles for zero-strain Li-ion cathodes.

Delithiation is the process of removing lithium ions from an electrode material during battery operation, particularly in lithium-ion batteries. This process is crucial for charging and discharging cycles, as it directly influences the performance, capacity, and longevity of the battery. Effective delithiation allows for the efficient transfer of lithium ions back and forth ...

Compared with lithium metal foil, the form of lithium metal powder ensures the precise control of prelithiation degree. Moreover, the high surface area of lithium metal powder facilitates the prelithiation more effectively. The chemical activity of lithium metal powder, however, is too high to accommodate the practical battery assembly process.

In situ X-ray photoelectron spectroscopy is applied to electrochemical lithiation/delithiation processes of an amorphous Si electrode sputter-deposited on a  $\text{Li}_6.6\text{La}_3\text{Zr}_{1.6}\text{Ta}_{0.4}\text{O}_{12}$  solid electrolyte. After the first lithiation, a broad Li peak appears at the Si surface, and peaks corresponding to bulk Si and Si suboxide significantly shift to lower binding ...

Anode materials based on silicon or tin, with distinctively higher theoretical specific capacities of 700 mAh/g compared to the commonly used graphite in Lithium-ion batteries exhibiting limited capacity of 370 mAh/g, are presently in the focus of intensive research studies as new anode materials the present work, coated and non-coated tin pyrophosphate ...

We report on the delithiation of  $\text{LiCoO}_2$  thin films using oxalic acid ( $\text{C}_2\text{H}_2\text{O}_4$ ) with the goal of understanding the structural degradation of an insertion oxide associated with Li chemical ...

a) The cathodic limits for the reduction of ternary selenides in the presence of lithium, with reference to the  $\text{Li}/\text{Li}^+$  electrode. b) Phase diagram of Li-P-Se, and c) the equilibrium voltage profile and phase equilibria for lithiation and delithiation reactions of  $\text{Li}_7\text{PSe}_6$  (b), the Li-stable compounds,  $\text{Li}_3\text{P}$  and  $\text{Li}_2\text{Se}$ , are



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highlighted in green, and the lithiation ...

We then design a delithiation algorithm and apply it to those lithiated structures for the estimation of the reversible specific capacity. ... Rhenium disulfide is a promising lithium ion battery ...

Prelithiation has been intensively investigated in high-capacity lithium-ion batteries (LIBs). However, the optimization of prelithiation degrees for long service life of LIBs still remains a challenge. ... DOMI, Y., USUI, H., IEUJI, N., NISHIKAWA, K., and SAKAGUCHI, H. Lithiation/delithiation properties of lithium silicide electrodes in ionic ...

Poly(ethylene oxide) (PEO)-based composite electrolytes (PCEs) are considered as promising candidates for next-generation lithium-metal batteries (LMBs) due to their high safety, easy fabrication, and good electrochemical stability. Here, we utilize operando grazing-incidence small-angle and wide-angle X-ray scattering to probe the correlation of ...

This was followed by a series of rate tests, with a C/5 charge (lithiation) before each discharge (delithiation) at C/5, C/2, C or 2 C. ... Capacity fade of NCA cathode for lithium ion batteries during accelerated calendar and cycle life tests. I. Comparison analysis between NCA and LCO cathodes in cylindrical lithium ion cells during long term ...

Here, we report ab initio molecular dynamics simulations of the lithiation and delithiation reactions that are important in Li-S batteries. The lithiation is studied on two low-energy surfaces, (100) and (001), of sulfur (S<sub>8</sub>), whereas delithiation is studied on the (111) surface of lithium sulfide (Li<sub>2</sub>S). The effect of electrolyte is ...

Lithium-ion battery degradation: how to model it Simon E. J. O'Kane 1,6,a, Weilong Ai 2,6,b, Ganesh Madabattula 1,6,c, Diego Alonso Alvarez 3,6, Robert Timms 4,6, Valentin Sulzer 5,6, Jacqueline Sophie Edge 1,6, Billy Wu 2,6, Gregory J. O'Er 1,6, Monica Marinescu 1,6 1 Department of Mechanical Engineering, Imperial College London, UK 2 Dyson School of ...

Probing lithiation and delithiation of thick sintered lithium-ion battery electrodes with neutron imaging. Journal of Power Sources, 2019; 419: 127 DOI: 10.1016/j.jpowsour.2019.02.075 Cite This ...

How lithium-ion batteries work. Like any other battery, a rechargeable lithium-ion battery is made of one or more power-generating compartments called cells. Each cell has essentially three components: a positive electrode (connected to the battery's positive or + terminal), a negative electrode (connected to the negative or - terminal), and a chemical called ...

How lithium-ion batteries work. Like any other battery, a rechargeable lithium-ion battery is made of one or more power-generating compartments called cells. Each cell has essentially three components: a ...

19 &#183; Aluminum-based anodes for lithium-ion batteries are attractive due to aluminum's high lithium



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storage capacity that would enable high energy density. Despite decades of work, ...

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