A reflection on lithium-ion battery cathode chemistry

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This review article provides a reflection on how fundamental studies have facilitated the discovery, optimization, and rational design of three major categories of oxide cathodes for lithium-ion batteries, and a personal perspective on the future of this important area. ... "A reflection on lithium-ion battery cathode chemistry" is a paper ...

A review article by Arumugam Manthiram, a professor of chemical engineering at the University of Texas at Austin, who reflects on the evolution and future of lithium-ion battery cathode ...

Lithium-ion battery (LIB) system consists of anode, cathode, electrolyte, separator to name few. The interaction between each component is very complicated, which hinders the full understanding of ...

Typically, a basic Li-ion cell (Figure 1) consists of a positive electrode (the cathode) and a negative electrode (the anode) in contact with an electrolyte containing Li-ions, which flow through a separator positioned between the two electrodes, collectively forming an integral part of the structure and function of the cell (Mosa and Aparicio, 2018).

The birth of rechargeable lithium batteries. Intercalation chemistry involving reactions between guest molecules or ions with solid hosts has been known for nearly 180 years 4.Schauffautl was the first to show the intercalation of sulfate ions into graphite in 1841.

Lithium-ion batteries have aided the portable electronics revolution for nearly three decades. They are now enabling vehicle electrification and beginning to enter the utility industry. The emergence and dominance of lithium-ion batteries are due to their higher energy density compared to other rechargeable battery systems, enabled by the design and development of high-energy density ...

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A reflection on lithium-ion battery cathode chemistry ... such as 55°C.46,47 The performance degradation of lithium-ion batteries is thought to partially result from chemical corrosion of the lithium transition metal oxide cathode in the acidic electrolyte. Although a non-aqueous electrolyte is required for lithium-ion batteries, a trace ...

The essential components of a lithium-ion cell are sketched in Figure 1.During discharge of the cell, the oxidation of Li atoms to positively charged lithium ions Li + and electrons occurs at the anode. The Li + ions

migrate from the anode to the cathode through the electrolyte, and for charge balance, the electrons flow from the current collector of the anode via an ...

A review article by Arumugam Manthiram, a professor at the University of Texas at Austin, traces the evolution of lithium-ion battery cathode chemistry from its origins to the present. It covers ...

A Reflection on Lithium-Ion Battery Cathode Chemistry. Nat. Commun. 2020, 11, 1550, DOI: 10.1038/s41467-020-15355-0. Google Scholar. 10. A reflection on lithium-ion battery cathode chemistry. Manthiram, Arumugam. Nature Communications ... Lithium iron phosphate is the first commercialized polyanion cathode for lithium-ion batteries.

ion batteries, it is enlightening to look back at the evolution of the cathode chemistry that made the modern lithium-ion technology feasible. This review article provides a reflection on

The 2019 Nobel Prize in Chemistry has been awarded to a trio of pioneers of the modern lithium-ion battery. Here, Professor Arumugam Manthiram looks back at the evolution of cathode chemistry, discussing the three major categories of oxide cathode materials with an emphasis on the fundamental solid-state chemistry that has enabled these advances.

A reflection on lithium-ion battery cathode chemistry. A Manthiram. Nature communications 11 (1), 1550, 2020. 2115: 2020: Lithium-sulfur batteries: progress and prospects. A Manthiram, SH Chung, C Zu. ... Journal of the American Chemical Society 138 (30), 9385-9388, 2016. 950: 2016:

A Reflection on Lithium-Ion Batteries from Lithium Resource Perspective ... it is time to look back at the cell composition of LIBs and the combination of various cathode and anode chemistry ...

A Reflection on Lithium-Ion Battery Cathode Chemistry; Investigation of Thin Film Materials for Next; The Effect of Active Material, Conductive Additives, and Binder in a Cathode Composite Electrode on Battery Performance; Improvement of Capacity of Nickel-Metal Hydride Battery; Recycling of Nickel Metal Hydride (Nimh) Batteries

Fig. 1 Schematic of a discharging lithium-ion battery with a lithiated-graphite negative electrode (anode) and an iron-phosphate positive electrode (cathode). Since lithium is more weakly bonded in the negative than in the positive electrode, lithium ions flow from the negative to the positive electrode, via the electrolyte (most commonly LiPF 6 in an organic, ...

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A reflection on lithium-ion battery cathode chemistry

Lithium-ion batteries have aided the portable electronics revolution for nearly three decades. They are now enabling vehicle electrification and beginning to enter the utility industry. The emergence and dominance of lithium-ion batteries are due to their higher energy density compared to other rechargeable battery systems, enabled by the design and development of ...

Choi and Aurbach looked back critically at the advance of the silicon anode, layered nickel-rich and lithium- and manganese-rich cathode materials, the lithium-metal anode, the lithium-sulfur battery, the ...

In this work, the transition metal dissolution (TMD) from the respective ternary layered LiMO2 (M = Mn, Co, Ni, Al) cathode active material was investigated as well as the lithiation degrees of the cathodes after charge/discharge cyclic aging. Furthermore, increased nickel contents in LiNixCoyMnzO2-based (NCM) cathode materials were studied, to elucidate ...

Cathode class II: spinel oxides. With a prior demonstration of lithium insertion into magnetite (Fe3O4) crystallizing in the spinel structure by Thackeray in South Africa21, the second class of cathode discovered is the spinel LiMn2O4 at the University of Oxford (Fig. 2), in which the Mn3+/4+ ions occupy the 16d octahedral sites and the Li+ ions occupy the 8a tetrahedral sites ...

icon anode, layered nickel-rich and lithium- and manganese-rich cathode materials, the lithium-metal anode, the lithium-sulfur battery, the metal-oxygen battery, the sodium-ion battery (SIB), and the rechargeable magnesium battery. They concluded that the performance of these post-LIBs had been overestimated in certain systems.[7]