Sodium phosphide and battery reaction

Sodium, the sixth most abundant element on the earth (ca. 2.74% in crust), is the second lightest alkali metal element that shares similar physical as well as chemical properties to lithium in many aspects, from which sodium is expected to replace lithium in secondary batteries. 7, 8 Besides, for the application in sodium-ion batteries (SIBs), the electrochemical redox potential of Na is ...

The development of transition metal phosphides as potential anode materials of sodium-ion batteries has been substantially hindered by their sluggish kinetics and significant volume change during the sodiation/desodiation process. In this work, we put forward a rational design strategy to construct a hollow-structured CoP@C composite to achieve ultrafast and ...

To design a high-performance sodium-ion battery anode, binary zinc phosphides (ZnP2 and Zn3P2) were synthesized by a facile solid-state heat treatment process, and their Na storage characteristics were ...

Nickel cobalt phosphide (NiCoP) is emerging as a potential electrocatalyst towards oxygen reduction reaction (ORR) and oxygen evolution reaction (OER). However, its ORR/OER activities are sluggish. Here, we investigated the roles of iron dopants in the Fe-doped NiCoP (Fe-NiCoP) in order to boost its ORR/OER kinetics. The density functional theory (DFT) ...

Phosphorus (P) offers a high theoretical capacity of 2596 mAh g-1 and thus has been intensively pursued as one of the most promising anodes for sodium-ion batteries. However, sodium storage in P anodes is facing significant technical challenges in terms of poor conductivity, large volume swelling, and an unstable solid-electrolyte interphase. These ...

Here we develop a real sodium "air" battery, in which the rechargeability of the battery relies on the reversible reaction of the formation of sodium peroxide dihydrate (Na2O2?2H2O). After ...

Phosphorus (P) is one of the most promising anode materials for sodium-ion batteries (SIBs) because of its high theoretical capacity upon Na storage (2590 mA h g -1), low sodiation potential (~0.4 V vs. Na/Na +) and ...

Transition metal phosphides hold great potential as sodium-ion batteries anode materials owing to their high theoretical capacity and modest plateau. However, volume changes and low intrinsic conductivity seriously largely hinder the further development of metal phosphide anodes. The design of phosphide anode materials with reasonable structure is conducive to ...

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Transition metal phosphides (TMPs) are promising candidates for sodium ion battery anode materials because

of their high theoretical capacity and earth abundance. Similar to many other P-based conversion type electrodes, TMPs suffer from large volumetric expansion upon cycling and thus quick performance fading. Moreover, TMPs are easily oxidized in air, ...

We developed metallic phosphide on carbon cloth (FeCoP-CC) as the air cathode for the Na O 2 batteries. o. The FeCoP-CC cathode improves the cycle life (200 cycles) and achieves a ...

ConspectusSodium ion batteries (NIB, NAB, SIB) are attracting interest as a potentially lower cost alternative to lithium ion batteries (LIB), with readily available and geographically democratic reserves of the metal. Tin is one of most promising SIB anode materials, which alloys with up to 3.75 Na, leading to a charge storage capacity of 847 mAh ...

Sodium (Na)-ion batteries (SIBs) have recently received much attention from the battery community because of their high compatibility with large-scale electrochemical energy storage requiring sufficient energy density, high power capability and low material cost.As such, considerable efforts have been devoted to the search for suitable Na storage materials with ...

The compound crystallizes in a hexagonal motif, often called the sodium arsenide structure. [4] Like K 3 P, solid Na 3 P features pentacoordinate P centers. [1] The first preparation of Na 3 P was first reported in the mid-19th century. French researcher, Alexandre Baudrimont prepared sodium phosphide by treating molten sodium with phosphorus pentachloride. [5] 8 Na (l) + ...

Properties. The structure of molecular sodium phosphide is similar to that of molecular lithium phosphide, Li 3 P, for both are trigonal pyramidal, with a lone pair of electrons on the central phosphorus atom.The ionic properties of Na 3 P are also similar to Li 3 P, which is known to be an ionic superconductor. The lowest energy conformation is the same for both molecules, non ...

Sodium-ion batteries (SIBs), as the next-generation high-performance electrochemical energy storage devices, have attracted widespread attention due to their cost-effectiveness and wide geographical distribution of sodium. As a crucial component of the structure of SIBs, the anode material plays a crucial role in determining its electrochemical ...

Combining metal to form metal phosphide is a promising strategy to address the fast capacity decay of P rooted from its low electronic conductivity and large volume changes upon cycling. Cu3P, which possesses a high theoretical gravimetric and volumetric capacity of 363 mAh·g-1 and 1028 Ah·L-1 and reasonable volume expansion of 156% during sodiation, ...

In order to improve the specific capacity of intercalation electrodes for sodium-ion batteries, it is necessary to identify materials capable of storing Na + ions by activating multi-electron redox reactions. Herein, we report a NaFeVPO 4 (SO 4) 2 compound as a multi-electron electrode that combines the most abundant Fe and V ions, having multiple oxidation states, ...

Sodium-ion batteries hydrogen evolution reaction ABSTRACT Transition metal phosphides, such as iron phosphide (FeP), have recently been studied as promising high performance active materials for sodium-ion batteries (SIBs) and hydrogen evolution reaction (HER) due to their excellent energy storage and conversion capabilities. To achieve long ...

Sodium-ion batteries (SIBs) are promising low-cost alternatives to lithium-ion batteries (LIBs) in energy storage applications because of the natural abundance of sodium as compared with lithium. However, the radius of Na + ions is ~50% ...

Sodium-ion batteries (SIBs) have been extensively studied as the potential alternative to lithium-ion batteries (LIBs) due to the abundant natural reserves and low price of sodium resources.

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Transition metal phosphides, such as iron phosphide (FeP), have recently been studied as promising high performance active materials for sodium-ion batteries (SIBs) and hydrogen evolution reaction (HER) due to their excellent energy storage and conversion capabilities. To achieve long cycle lifetime, high rate sodium storage performance and stable HER reactivity, ...

Sodium could be competing with low-cost lithium-ion batteries--these lithium iron phosphate batteries figure into a growing fraction of EV sales. Take a tour of some other non-lithium-based ...

Sodium-ion batteries (SIBs), as the next-generation high-performance electrochemical energy storage devices, have attracted widespread attention due to their cost-effectiveness and wide geographical distribution of ...

DOI: 10.1016/J.ELECTACTA.2019.05.071 Corpus ID: 181998929; High-rate and stable iron phosphide nanorods anode for sodium-ion battery @article{Wang2019HighrateAS, title={High-rate and stable iron phosphide nanorods anode for sodium-ion battery}, author={L. G. Wang and Xiaojuan Zhao and Si-Min Dai and Yan Shen and Mingkui Wang}, journal={Electrochimica ...

This study reports iron phosphide (FeP) nanorod arrays on Ti substrates (FeP NRs/Ti) as anode for full sodium-ion batteries. The FeP nanorod arrays electrodes exhibit a high-rate capability of 414.7 mAh g -1 at 100 mA g -1 in the semi-battery tests (sodium foil as the counterpart) and 196.2 mAh g -1 at 2000 mA g -1.The high reversible capacity can be ...

Another vanadium-based phosphate layered material, Na 3 V 3 (PO 4) 4, has been reported recently.Na 3 V 3 (PO 4) 4 exhibits the highest operating voltage (~3.9 V) in the currently reported sodium-containing vanadium-based orthophosphates and good structural stability [34, 35].Nevertheless, Na 3 V 3 (PO 4) 4 cathode material did not attract widespread ...

Energy generation and storage technologies have gained a lot of interest for everyday applications. Durable and efficient energy storage systems are essential to keep up with the world"s ever-increasing energy demands. Sodium-ion batteries (NIBs) have been considered a promising alternative for the future generation of electric storage devices owing to their similar ...

This review provides a systematic summary of the recent research advancements in metal phosphide anode materials for sodium-ion batteries (SIBs), covering ...

Turning to metallic materials, theoretical and experimental studies have demonstrated that Sn and its alloys (Sn-Cu, Sn-Ni, etc.) have the ability to store Na via electrochemical alloying...

Tin phosphide (Sn4P3) combined with the good conductivity of tin (Sn) and high capacity of phosphorus has been reported to be a potential anode material for the sodium ion battery (SIB). However, the preparation of Sn4P3 is limited to ball-milling and compositing with carbon materials. The novel and detailed structure of Sn4P3 itself has so far not been ...

DOI: 10.1016/J.ENSM.2018.03.009 Corpus ID: 51733487; Bifunctional porous iron phosphide/carbon nanostructure enabled high-performance sodium-ion battery and hydrogen evolution reaction