Topological materials for batteries

Can topological quantum materials be used in metal-ion batteries?
In this review, we summarize the recent progress on the performance of topological quantum materials in metal-ion batteries, focusing on 3D porous topological semimetals as anodes for Li, Na, and K ions batteries. Some of the challenges that this field is currently facing are as follows:

Can 3D porous topological semimetals be used for battery anode?
High-pressure-assisted design of porous topological semimetal As discussed in the previous sections,one can see that 3D porous topological semimetals composed of light elements are very promisingfor the anode of Li-,Na-,and K-ion batteries.

Can topological quantum materials be used for energy conversion and storage?
We describe the open problems and the potential applications of TQMs in water splitting,batteries,supercapacitors and other prospects in energy conversion and storage. Topological quantum materials host protected,high-mobility surface states which can be used for energy conversion and storage.

Can all-carbon-based topological semimetal be used for Lib anode material?
Summary In this study we have explored the possibilityof using all-carbon-based topological semimetal for LIB anode material which has the merits of intrinsic high electronic conductivity and ordered porosity for Li-ion transport; moreover,carbon is abundant in resources,flexible in bonding,and ever-changing in morphology.

Are 3D porous topological quantum materials suitable for metal-ion batteries (Mibs) anodes?
In this sense,3D porous topological quantum materials (TQMs),a class of compounds having special band structures with high intrinsic electric conductivity protected by topologies that differ from conventional porous nanomaterials,provide us the promising candidate materialsfor metal-ion batteries (MIBs) anodes.

Which topological semimetal is used for Li-ion battery anode material?
All-carbon-based porous topological semimetal for Li-ion battery anode material JunyiLiu, ShuoWang, and QiangSunAuthors Info & Affiliations Edited by George William Crabtree, Argonne National Laboratory, Argonne, IL, and approved December 16, 2016 (received for review October 31, 2016) January 9, 2017 114(4) 651-656

The 2019 Nobel Prize in Chemistry and the 2016 Nobel Prize in Physics were awarded for the research of lithium-ion batteries and topological quantum materials, respectively, which have greatly ...

Therefore, star-shaped polymers are desirable electrolyte matrix materials for solid-state batteries. 3.1 Star Polymer Electrolytes Based on Different Core. The star polymer is an ideal candidate of polymer electrolyte ...

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These remarkable properties endow semimetallic pmma-C32 as a promising anode material for metal-ion batteries, providing fast charge and discharge rates. This research not only broadens the family of three-dimensional carbon materials, but also greatly improves the performance for universal metal-ion battery anode materials through ...

In this work, using machine learning and first-principle calculations, for the first time we have screened 7386 topological quantum materials with low diffusion energy barriers. Especially, topological semimetal ...

One application that has gained significant interest in recent years is the use of topologi- cal materials in batteries. The first part of this dissertation explores the use of Na3BixSb1-x alloys in Dirac semimetal phase as anode materials in Na-ion batteries.

We propose an innovative design for quantum batteries (QBs) that involves coupling two-level systems to a topological photonic waveguide. Employing the resolvent method, we analytically explore the thermodynamic performances of QBs.

The 2016 Nobel Prize in Physics highlighted the importance of topological state in science and technology. Here we explore the possibility of using all-carbon-based topological semimetal (ACTS) for lithium-ion battery anode material based on the merits of intrinsic high electronic conductivity and ordered porosity.

Recent studies have suggested that more than 27% of existing materials are topological and exhibit intrinsically high electrical conductivity with high stability protected by topology, which can meet the requirement that the ...

Topological indices are persistent numerical fields of a graph that provide information about the structure of graphs and have been shown to be extremely useful in forecasting physical characteristics of lithium-ion batteries. Lithium-ion batteries have become indispensable in modern technologies. The discovery of innovative materials in battery ...

One application that has gained significant interest in recent years is the use of topologi- cal materials in batteries. The first part of this dissertation explores the use of Na3BixSb1-x alloys ...

many classes of topological materials 6 - 9 and their novel applications 10 including electrodes for Li-ion batteries 11 . The presence of symmetry-enforced Dirac states in a top ological ma-

The rational design of a stable and catalytic carbon cathode is crucial for the development of rechargeable lithium-oxygen (Li O 2) batteries.An edge-site-free and topological-defect-rich graphene-based material is proposed as a pure carbon cathode that drastically improves Li O 2 battery performance, even in the absence of extra catalysts and mediators.

Topological quantum materials host protected, high-mobility surface states which can be used for energy

conversion and storage. This Perspective discusses recent ...

The 2016 Nobel Prize in Physics highlighted the importance of topological state in science and technology. Here we explore the possibility of using all-carbon-based topological semimetal (ACTS) for lithium-ion battery ...

Topological quantum materials (TQMs) have symmetry-protected band structures with useful electronic properties that have applications in information, sensing, energy and other technologies. In the past 10 years, applications of TQMs in the fields of energy conversion and storage, including water splitting, ethanol electro-oxidation, batteries, ...

Among the key parts of metal-ion batteries, cathode materials significantly affect the energy density and cycling stability. However, due to the large size of K +, not much progress has been made on cathode materials for ...

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