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金属锂负极专刊

Lithium Metal Anodes

Guest Editors: Qiang Zhang (张强)

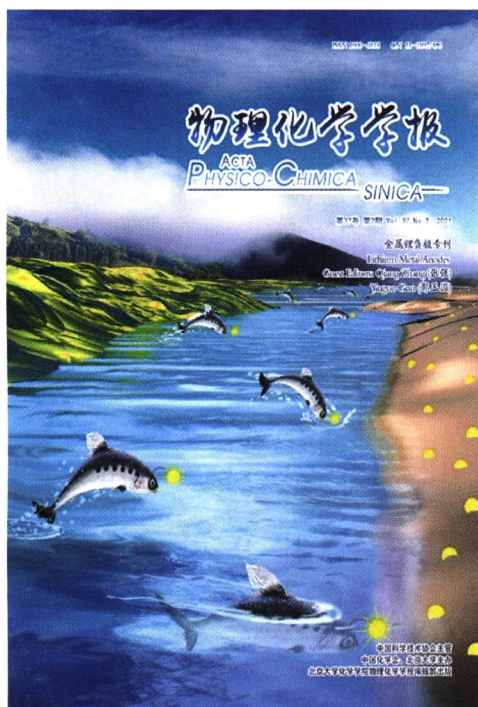
Yuguo Guo (郭玉国)

中国科学技术协会主管

中国化学会、北京大学主办

北京大学化学学院物理化学学报编辑部出版

COVER



The cover image shows that the trace amount of a liquid electrolyte between the solid state electrolyte and the solid electrode, similar to a stream bridging two mountains, improves the solid-solid interface contact in solid-state batteries. In article No. 2005003, Zhu *et al.* constructed a salt-concentrated liquid electrolyte for establishing a conformal solid-liquid-solid interface to promote the interfacial Li-ion transport and realized stable cycling of solid-state lithium-metal battery in pouch cell scale.

CONTENTS

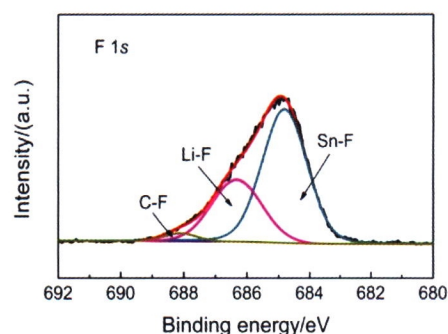
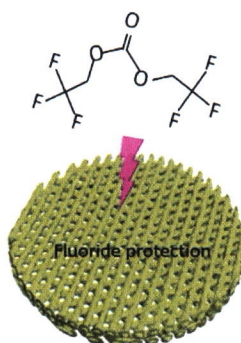
通讯 COMMUNICATION

利用原位氟化保护层改善三维锡锂合金/碳纸
负极贫电解液下性能

王志达, 冯元宸, 卢松涛, 王锐, 秦伟, 吴晓宏

Improvement in Performance of Three-
Dimensional SnLi/Carbon Paper Anode in
Lean Electrolyte with *In Situ* Fluorinated
Protection Layer

Zhida Wang, Yuancheng Feng, Songtao Lu,
Rui Wang, Wei Qin, Xiaohong Wu



Acta Phys. -Chim. Sin. **2021**, 37 (2), 2008082
doi: 10.3866/PKU.WHXB202008082

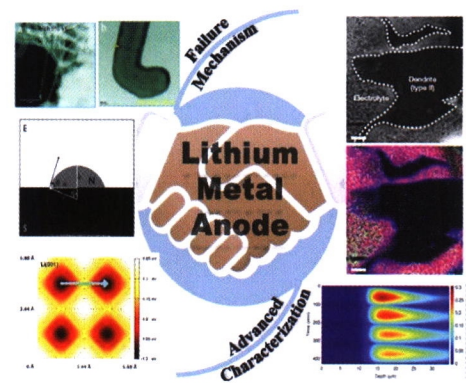
The synergy of a bis(2,2,2-trifluorotoluene) carbonate additive and interconnected alloy provides remarkable performance owing to the dense fluorinated solid electrolyte interface layer.

金属锂负极失效机制及其先进表征技术

岳昕阳, 马萃, 包戡, 杨思宇, 陈东, 吴晓京, 周永宁

Failure Mechanisms of Lithium Metal Anode and Their Advanced Characterization Technologies

Xinyang Yue, Cui Ma, Jian Bao, Siyu Yang, Dong Chen, Xiaojing Wu, Yongning Zhou



Acta Phys. -Chim. Sin. **2021**, 37 (2), 2005012
doi: 10.3866/PKU.WHXB202105012

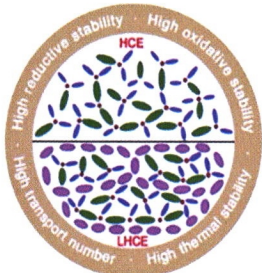
Understanding the failure mechanisms of Li metal anodes is essential for accelerating the development of Li metal anodes. Advanced characterization technologies provide effective approaches for in-depth investigating Li metal anodes.

锂金属电池用高浓度电解液体系研究进展

吴晨, 周颖, 朱晓龙, 詹志之, 杨汉西, 钱江锋

Research Progress on High Concentration Electrolytes for Li Metal Batteries

Chen Wu, Ying Zhou, Xiaolong Zhu, Minzhi Zhan, Hanxi Yang, Jiangfeng Qian



Acta Phys. -Chim. Sin. **2021**, 37 (2), 2008044
doi: 10.3866/PKU.WHXB202008044

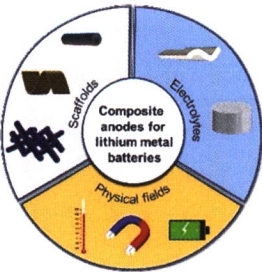
In this review, the latest progress of high and localized-high concentration electrolytes for Li metal batteries is summarized, with special attention on the solvation chemistry structure, physicochemical property as well as interfacial-stabilizing mechanism of these electrolytes with Li metal anode.

锂金属电池中的复合负极

赵雨萌, 任凌霄, 王澳轩, 罗加严

Composite Anodes for Lithium Metal Batteries

Yumeng Zhao, Lingxiao Ren, Aoxuan Wang, Jiayan Luo



Acta Phys. -Chim. Sin. **2021**, 37 (2), 2008090
doi: 10.3866/PKU.WHXB202008090

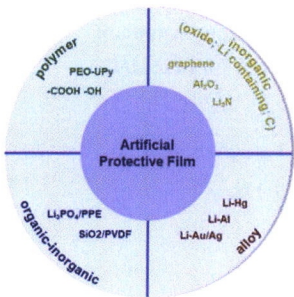
A comprehensive understanding of composite lithium metal anodes is promising, *i.e.*, from internal structure of batteries to external physical fields.

锂金属负极人造保护膜的研究进展

刘冬冬, 陈超, 熊训辉

Research Progress on Artificial Protective Films for Lithium Metal Anodes

Dongdong Liu, Chao Chen, Xunhui Xiong



Acta Phys. -Chim. Sin. **2021**, 37 (2), 2008078
doi: 10.3866/PKU.WHXB202008078

Research progress on polymer protective films, inorganic protective films, composite protective films, and alloy protective films for lithium metal anodes was summarized.

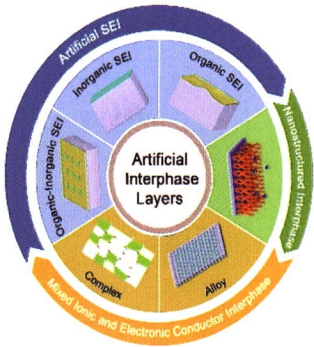
人工界面层在金属锂负极中的应用

关俊, 李念武, 于乐

Artificial Interphase Layers for Lithium Metal Anode

Jun Guan, Nianwu Li, Le Yu

Acta Phys. -Chim. Sin. **2021**, 37 (2), 2009011
doi: 10.3866/PKU.WHXB202009011



Artificial interphase layers have been summarized into artificial SEI layers, mixed ionic and electronic conductor interphase layers, and nanostructured interphase passivation layers.

功能化固态电解质膜改性锂金属负极的研究进展

钱华明, 李喜飞

Progress in Functional Solid Electrolyte Interphases for Boosting Li Metal Anode

Huaming Qian, Xifei Li

Acta Phys. -Chim. Sin. **2021**, 37 (2), 2008092
doi: 10.3866/PKU.WHXB202008092



Functional SEIs with the desired ion conductivity, mechanical strength and electron insulation properties are designed to boost the Li anode performance.

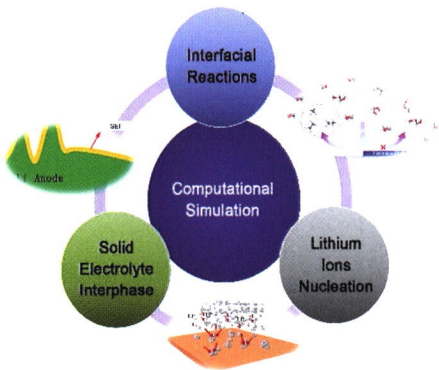
计算模拟在锂金属负极研究中的应用

华广斌, 樊晏辰, 张千帆

Application of Computational Simulation on the Study of Lithium Metal Anodes

Guangbin Hua, Yanchen Fan, Qianfan Zhang

Acta Phys. -Chim. Sin. **2021**, 37 (2), 2008089
doi: 10.3866/PKU.WHXB202008089



Functional SEIs with the desired ion conductivity, mechanical strength and electron insulation properties are designed to boost the Li anode performance.

论文 ARTICLE

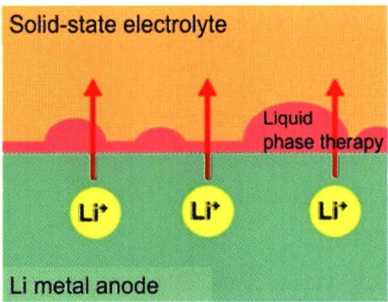
基于局部高盐界面润湿策略构筑的固态金属锂软包电池

朱高龙, 赵辰孜, 袁洪, 南皓雄, 赵铂琛, 侯立鹏, 何传新, 刘全兵, 黄佳琦

Liquid Phase Therapy with Localized High-Concentration Electrolytes for Solid-State Li Metal Pouch Cells

Gaolong Zhu, Chenzi Zhao, Hong Yuan, Haoxiong Nan, Bochen Zhao, Lipeng Hou, Chuangxin He, Quanbing Liu, Jiaqi Huang

Acta Phys. -Chim. Sin. **2021**, 37 (2), 2005003
doi: 10.3866/PKU.WHXB202005003



Liquid phase therapy with localized high-concentrated electrolytes enhances interfacial ion transportation between the Li anode and sulfide electrolytes in working pouch cells.

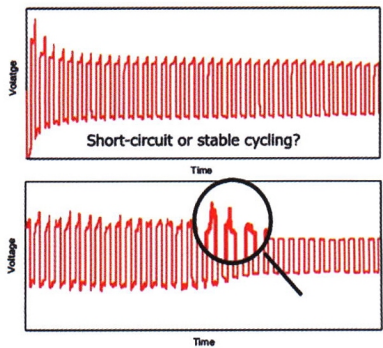
锂金属电池研究中对称电池的短路现象

康丹苗, Noam Hart, 肖沐野, John P. Lemmon

Short Circuit of Symmetrical Li/Li Cell in Li Metal Anode Research

Danmiao Kang, Noam Hart, Muye Xiao, John P. Lemmon

Acta Phys. -Chim. Sin. 2021, 37 (2), 2008013
doi: 10.3866/PKU.WHXB202008013



Voltage profiles provide information to distinguish short circuit and activation processes in symmetrical Li/Li cells.

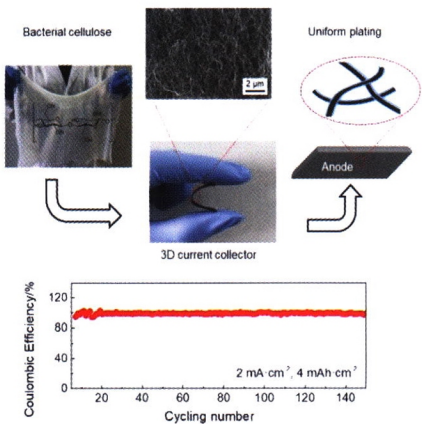
细菌纤维素衍生的三维碳集流体用于无枝晶的锂金属负极

张云博, 林乔伟, 韩俊伟, 韩志远, 李瞳, 康飞宇, 杨全红, 吕伟

Bacterial Cellulose-Derived Three-Dimensional Carbon Current Collectors for Dendrite-Free Lithium Metal Anodes

Yunbo Zhang, Qiaowei Lin, Junwei Han, Zhiyuan Han, Tong Li, Feiyu Kang, Quan-Hong Yang, Wei Lü

Acta Phys. -Chim. Sin. 2021, 37 (2), 2008088
doi: 10.3866/PKU.WHXB202008088



A low-cost and lightweight carbon current collector derived from bacterial cellulose enables dendrite-free Li deposition for Li metal anodes.

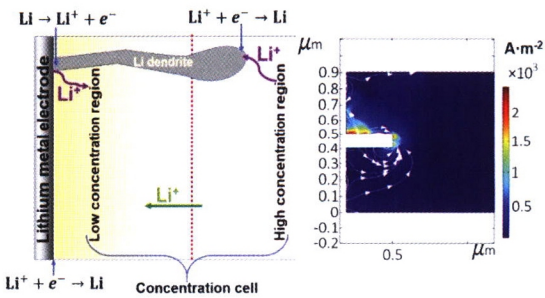
电极界面浓差极化对锂金属沉积的影响

何一涛, 丁飞, 林立, 王志红, 吕喆, 张耀辉

Influence of Interfacial Concentration Polarization on Lithium Metal Electrodeposition

Yitao He, Fei Ding, Li Lin, Zhihong Wang, Zhe Lü, Yaohui Zhang

Acta Phys. -Chim. Sin. 2021, 37 (2), 2009001
doi: 10.3866/PKU.WHXB202009001



The interfacial concentration difference battery causes the deposition of Li ions on the top of the dendrites and the dissolution of Li ions at the roots of the dendrite.

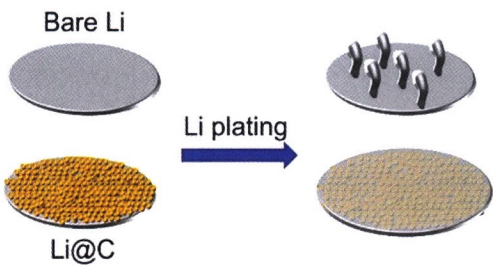
稳定锂电化学沉积和溶解行为的 LiC₆ 异质微结构界面层

张自博, 邓伟, 周旭峰, 刘兆平

LiC₆ Heterogeneous Interface for Stable Lithium Plating and Stripping

Zibo Zhang, Wei Deng, Xufeng Zhou, Zhaoping Liu

Acta Phys. -Chim. Sin. 2021, 37 (2), 2008073
doi: 10.3866/PKU.WHXB202008073



Bare lithium metal tends to deposit with a dendritic morphology during the plating process. The LiC₆ heterogeneous interfacial layer can homogenize the surface current density and lithium ion flux of the lithium foil simultaneously, thereby effectively improving the uniformity and reversibility of lithium deposition and dissolution behavior.

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