

附件 2 浙江水利水电学院“南浔青年学者”申请表

姓名	闫慧慧	出生年月年龄 (年龄)	1988 年 3 月 岁 (36 周岁)	参加工作时间	2024 年 12 月
现所在单位 (部门)	机械工程学院	最高学历/学位	博士	专业技术职务	无
符合条款	科研类: SCI TOP 期刊两篇, SCI 期刊一篇, 共计 120 分				
所涉业绩	教学类 绩点: _____				
	科研类 绩点: _____	<p>[1] Huihui Yan, Cheng Yang, Liping Zhao, Jing Liu, Peng Zhang, Lian Gao. Proton-assisted Mixed-valence Vanadium Oxides Cathode with Ultra-high Performance for Rechargeable Aqueous Zinc Ion Batteries. <i>Electrochimical Acta</i>. 429 (2022), 141003. (SCI, TOP, 50 分)</p> <p>[2] Huihui Yan, Kun Wang, Liping Zhao, Peng Zhang, Jing Liu, Lian Gao. Ultra-flexible Al₂O₃ fibers: A novel catalyst support material for sustainable catalysis. <i>Ceramics International</i>. 49 (2023) 30257–30265. (SCI, TOP, 50 分)</p> <p>[3] Huihui Yan, Kun Wang, Liping Zhao, Peng Zhang, Jing Liu, Han Chen, Lian Gao. Flexible Hollow Ni/Al₂O₃ Fibers: A Sustainable and Reusable Catalyst for Efficient Dry Reforming of Methane. <i>Journal of the American Ceramic Society</i>. (2024), 1-10. (SCI, 20 分)</p>			
	人才称号类 绩点: _____				
	总绩点				
	备注: 请严格按照《浙江水利水电学院“南浔青年学者”实施办法(试行)》(浙水院(2022)114号)附件《业绩成果绩点赋值项目库》的类目、分类、等级(等次)、绩点填写。				
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引证检索报告

一、委托信息

- 被检作者：闫慧慧
- 委托单位/作者单位：上海交通大学
- 检索目的：研究生学位申请或求职
- 论文发表年：2022-2024
- 代表作篇数：3 篇

二、检索范围

- Science Citation Index Expanded (SCI-EXPANDED) 1900-至今
- JCR 2022-2023; 中国科学院期刊分区表 2022-2023 升级版

三、检索结果

- 有 3 篇被 SCI 收录，详细数据见附件一。

SCI 收录期刊影响因子及分区如下表。

序号	期刊名	发表年	篇数	影响因子	JCR 分区	中科院 大类分区	中科院 小类分区
1	JOURNAL OF THE AMERICAN CERAMIC SOCIETY	2024	1	3.5	Q1	材料科学 3 区	材料科学: 硅酸盐 2 区
2	CERAMICS INTERNATIONAL	2023	1	5.1	Q1	材料科学 2 区 TOP	材料科学: 硅酸盐 1 区
3	ELECTROCHIMICA ACTA	2022	1	6.6	Q2	材料科学 2 区 TOP	电化学 2 区

检索报告人： 韩一凡

审核人： 郑菲

报告单位：

完成时间：



中国科学院文献情报中心

2024年08月26日

附件:

一、SCI收录情况

Record 1 of 3

Title: Flexible hollow Ni/Al₂O₃ fibers: A sustainable and reusable catalyst for efficient dry reforming of methane

Author(s): Yan, HH (Yan, Huihui); Wang, K (Wang, Kun); Zhao, LP (Zhao, Liping); Zhang, P (Zhang, Peng); Chen, H (Chen, Han); Liu, J (Liu, Jing); Gao, L (Gao, Lian)

Source: JOURNAL OF THE AMERICAN CERAMIC SOCIETY Volume: 107 Issue: 10 Pages: 6764-6773 DOI: 10.1111/jace.19990 Early Access Date: JUL 2024 Published Date: 2024 OCT

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Record 2 of 3

Title: Ultra-flexible Al₂O₃ fibers: A novel catalyst support material for sustainable catalysis

Author(s): Yan, HH (Yan, Huihui); Wang, K (Wang, Kun); Zhao, LP (Zhao, Liping); Zhang, P (Zhang, Peng); Liu, J (Liu, Jing); Gao, L (Gao, Lian)

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Record 3 of 3

Title: Proton-assisted mixed-valence vanadium oxides cathode with long-term stability for rechargeable aqueous zinc ion batteries

Author(s): Yan, HH (Yan, Huihui); Yang, C (Yang, Cheng); Zhao, LP (Zhao, Liping); Liu, J (Liu, Jing); Zhang, P (Zhang, Peng); Gao, L (Gao, Lian)

Source: ELECTROCHIMICA ACTA Volume: 429 Article Number: 141003 DOI: 10.1016/j.electacta.2022.141003 Early Access Date: AUG 2022 Published Date: 2022 OCT 10

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Output Date: 2024-08-25

(End)



Proton-assisted mixed-valence vanadium oxides cathode with long-term stability for rechargeable aqueous zinc ion batteries

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ARTICLE INFO

Keywords:

Aqueous batteries
Zinc ion batteries
Vanadium oxide
Grotthuss proton transport mechanism
Cathode materials

ABSTRACT

In this work, we developed a rGO assisted vanadium oxide xerogel (abbreviate as VOHG) as cathode material for rechargeable aqueous zinc ion batteries (RA-ZIBs). The VOHG cathode exhibits an ultra-high specific capacity of 625 mA h g⁻¹ at current density of 0.1 A g⁻¹, superior reversibility and a long cycle life with a coulombic efficiency of 100.0% after 10,000 cycles. The VOHG material has mixed valent vanadium ions V⁴⁺/V⁵⁺ and a layer structure with interlayer water. The interlayer water acts as soft support for the VO₆ octahedron, forming a large space in the layers for H⁺/Zn²⁺ intercalation, which improves the migration rate of Zn²⁺ due to its charge shielding effect. Protons can move quickly through the interlayer water network by Grotthuss proton transport mechanism. The application of the unique structure of VOHG makes zinc ions battery will be a promising candidate of energy storage device with high-capacity and long cycle stability.

1. Introduction

Lithium ion batteries (LIBs) have been widely used in the market [1–4]. However, safety issue of organic electrolyte in large-scale lithium battery devices is still a potential hazard [5–8]. Developing solid electrolyte batteries [3,9] and aqueous rechargeable batteries [1,10,11] are two effective ways. Rechargeable aqueous zinc ion batteries (RA-ZIBs) have been widely investigated by researchers due to their satisfied security, high theoretical capacity (819 mA h g⁻¹), proper redox potential (–0.76 V vs the standard hydrogen electrode), and low cost [12–16]. However, insertion of bivalent Zn²⁺ in the host materials is more difficult because of the strong interaction between the host lattice result from higher charge and larger atomic weight of zinc ions, eventually leading to sluggish solid-state diffusion and large potential polarization. This affects the high-current charge-discharge stability and cycle life of the battery. Thus, lack of suitable cathode materials is the main bottleneck restricting the development of RA-ZIBs.

So far, the cathode materials of RA-ZIBs reported are mainly concentrated in vanadium oxide [17–20], manganese oxide [21–24], and Prussian blue analogues [25,26]. Among them, Vanadium based materials, including V₂O₅ [9], VO₂ [20,27], NaV₃O₈·1.5H₂O [28], FeVO₄·nH₂O [29], V₃O₇·H₂O [30] have been recognized as promising

cathode materials for high-safety RA-ZIBs in applications. Nevertheless, researchers found that vanadium oxide as cathode material has the following prominent scientific problems. First, vanadium oxide has poor electrical conductivity. Second, the crystal structure of vanadium oxide is unstable in the process of Zn²⁺ (de)intercalation. Third, the migration kinetics of Zn²⁺ is slow due to its high charge and large atomic weight. Therefore, it is worth deliberating these difficulties. Vanadium oxide xerogel was prepared by Inamoto et al. [31] and successfully applied as the active cathode material for magnesium rechargeable battery. Vanadium oxide xerogel (e.g. V₂O₅·nH₂O) is an amorphous hydrated vanadium oxide usually containing water of crystallization [32,33]. Some of them have layered structures and possess typically open ion diffusion channels between layers, which have been widely studied in LIBs, NIBs, ZIBs, etc. [10,34,35]. The V₅O₁₂·6H₂O can be understood as an oxygen deficient V₂O₅·nH₂O compound with a molar ratio of V⁵⁺ / V⁴⁺ of 4. Compared with single valence of vanadium oxide (such as V₂O₅), V₅O₁₂·6H₂O is prone to form V⁵⁺/V⁴⁺ and V⁴⁺/V³⁺ redox pairs during redox reactions. However, V₅O₁₂·6H₂O has rarely been investigated so far.

Herein, we reported a rGO assisted vanadium oxide xerogel (VOHG) as the RA-ZIBs cathode material. The vanadium oxide xerogel (VOH) has mixed valent vanadium and a layer structure containing interlayer

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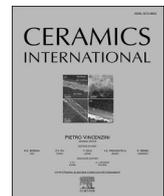
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Ultra-flexible Al₂O₃ fibers: A novel catalyst support material for sustainable catalysis

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Keywords:
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Flexible fibers
Al₂O₃ fibers
Catalysts

ABSTRACT

Flexible aluminum oxide (Al₂O₃) fibers were prepared by the blow spinning method and their potential as a high-temperature catalyst support was investigated. The synthesized Al₂O₃ fibers exhibited remarkable flexibility in both mechanical compression and recovery tests, which remained intact in a wide temperature range from −196 °C to 1200 °C. Moreover, their low thermal conductivity of 0.030 W K^{−1}•m^{−1}, demonstrated an outstanding thermal insulation. Subsequently, nickel nanoparticles were uniformly distributed on the surface of the Al₂O₃ fibers as a self-supporting catalyst using a conventional impregnation method. The resulting self-supporting Ni/Al₂O₃ catalyst demonstrated remarkable thermo-catalytic performance and re-activation capability at high temperatures for thermocatalytic reaction of dry reforming of methane (DRM). Our findings highlight the potential of pure Al₂O₃ flexible fibers as a versatile material for various industrial applications, including high-temperature catalysis.

1. Introduction

Ceramic materials offer several advantages such as high temperature resistance, chemical corrosion tolerance, and low thermal conductivity, which make them useful in various industries, including refractory, superconductivity, and aerospace [1–4]. However, the inherent brittleness, low specific surface areas, and low porosity of conventional ceramics limits their application in emerging fields [5–9]. Advanced flexible inorganic ceramic fiber materials have received considerable attentions due to their low thermal conductivity, high specific surface area, low density, and excellent chemical and thermal stability [5, 10–13]. Flexible ceramic fibers are usually prepared by electrospinning, centrifugal spinning, or blow spinning method. The electrospinning method can produce long nanofibers, but suffers from sintered adhesion, which makes fibers less flexible, as well as low efficiency in fabrication [14–18]. Centrifugal spinning method is the most applied method for enterprises to produce inorganic fibers but mostly used to prepare short or coarse fibers [19,20]. The short-cut fibers produced by electrospinning or centrifugal spinning have been reprocessed into flexible ceramic sponges, which are also known as flexible ceramic aerogels [15, 21,22]. For example, flexible aluminosilicate aerogels were prepared applying short-cutting electrospinning silica fibers and aluminosilicate

sol through freeze-drying processes [4]. However, the ceramic aerogels produced using this method have limited flexibility and are mostly in bulk form. Furthermore, the complex preparation process and high cost of this method limit its mass production and further applications. It is worth noting that blow spinning is a more preferred process in industry due to its feasibility in mass production of fibers [23–27]. A series of flexible Al₂O₃-compounds fibers have been successfully prepared using the blow spinning method [6,12,28]. However, the preparation of pure Al₂O₃ fibers through blow spinning has not been reported yet.

Zu et al. [29] prepared super heat-resistant Al₂O₃ aerogels via a combination of acetone-aniline in situ water formation method, supercritical fluid modification, and hexamethyldisilazane gas phase modification. The heat resistance of alumina aerogel is enhanced up to 1300 °C, but the complex preparation process and high cost of this method limit its mass production and further applications. Lucas et al. [2] fabricated the hollow-tube Al₂O₃ nanolattices by template method, containing two-photon lithography, atomic layer deposition, and oxygen plasma etching. The structural material of the three-dimensional hollow-tube Al₂O₃ nanolattices is simultaneously ultralight and energy-absorbing, and it can recover its original shape after being compressed at a strain of more than 50%. However, the mechanical strength properties of this three-dimensional structure still have much

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RESEARCH ARTICLE

Flexible hollow Ni/Al₂O₃ fibers: A sustainable and reusable catalyst for efficient dry reforming of methane

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Abstract

A new type of Ni/Al₂O₃ self-supporting catalysts, with high specific surface area, was fabricated by blow-spinning technology. These Ni/Al₂O₃ self-supporting catalysts are hollow flexible fibers and were utilized for the dry reforming of methane. The Ni/Al₂O₃ catalysts exhibited exceptional catalytic performance, maintaining their activity for over 150-h at a high temperature of 800°C. The Ni nanoparticles dispersed on the hollow fibers demonstrated remarkable resistance to sintering and coking during high-temperature catalysis. This was a noteworthy feature, as sintering and coking are common challenges faced by catalysts during high-temperature reactions. Furthermore, the catalysts retained its activity even after a rigorous 150-h test at 800°C, indicating its durability and stability. Importantly, the Ni/Al₂O₃ self-supporting could be successfully reactivated after the test, further highlighting its reusable nature. This study offers promising new avenues for the development of high-temperature, self-supporting, and reactivatable catalysts.

KEYWORDS

catalyst, dry reforming of methane, fibers, Ni/Al₂O₃

1 | INTRODUCTION

The dry reforming of methane (DRM) catalysis stands as a promising approach toward achieving carbon neutrality, thereby playing a pivotal role in shaping the future of green energy technologies. This catalytic process involves the conversion of two greenhouse gases, CH₄, and CO₂, into syngas. Syngas, also known as synthesis gas, serves as a precursor for the synthesis of long-chain fuels, such as methanol, ethanol, and even hydrocarbons.^{1–3} The significance of DRM catalysis lies in its ability to convert waste greenhouse gases into valuable energy sources, thus contributing to the reduction of greenhouse gas emissions and the promotion of sustainable energy production. However, this catalytic process typically requires

high operating temperatures exceeding 700°C, posing significant challenges for catalyst supports. Catalysts, particularly those employed in high-temperature catalysis like the DRM, commonly encounter challenges such as sintering and coking over prolonged use, ultimately leading to catalyst deactivation.^{1,2,4,5} A prevalent approach to mitigate coking involves enhancing the alkalinity of the support^{3,6} or reducing the particle size of the catalyst.⁷ However, fine metal nanoparticles confront challenge in particle sintering during high-temperature catalysis, which results in an increase in particle size and ultimately a decrease in catalytic activity. One important strategy for inhibiting catalyst sintering is the domain limiting effect, for example, core-shell structures, impregnation of metal nanoparticles in the porous materials, and in situ grown