Activated Carbon

1-Innovating high-performance aqueous sodium-ion batteries with ice-resistant inorganic electrolytes for -40 °C applications

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By Liu, GZ (Liu, Gengzheng) [1] ; Hao, HL (Hao, Huilian) [1] ; Guo, ZF (Guo, Zefei) [1] ; Yang, J (Yang, Jun) [1] ; Shen, WZ (Shen, Wenzhong) [2] , [3] Source ENERGY STORAGE MATERIALS Volume 76 DOI 10.1016/j.ensm.2025.104149 Article Number 104149 Published MAR 2025 Early Access MAR 2025 Indexed 2025-03-18 Document Type Article

Abstract

Aqueous sodium-ion batteries (ASIBs) are increasingly recognized for their high safety, eco-friendliness, and cost advantages. However, the high freezing point of aqueous electrolytes significantly limits their practical applications in low-temperature environments. To address this challenge, this study introduces an innovative 0.5 M NaCl + 2.8 M MgCl2 & sdot;6H2O electrolyte, effectively lowering the freezing point to-50 degrees C. The strong interaction between Mg2+ and water molecules disrupts the hydrogen bonding network in water. As a result, the optimized electrolyte exhibits an impressive ionic conductivity of 9.36 mS cm-1 even at-50 degrees C. Using Na2CoFe(CN)6 as the cathode and activated carbon as the anode materials for ASIBs, the system achieved an excellent discharge capacity of 74.0 mAh g-1 at-40 degrees C under 1 C (1 C = 150 mA g-1). Even more impressively, the battery showed no capacity degradation after 10,000 cycles at-40 degrees C and successfully lit an LED bulb at the same temperature. This work not only broadens the applicability of ASIBs but also provides a robust foundation for the development of high-performance, low-temperature energy storage solutions capable of meeting demanding environmental requirements.

Keywords

Author Keywords

Aqueous sodium-ion batteriesLow-temperatureLong cycle lifeHigh ionic conductivityMagnesium chloride hexahydrate

Keywords Plus

TEMPERATUREENERGY

Activated Carbon

2-Technology status to treat PFAS-contaminated water and limiting factors for their effective full-scale application

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By Tshangana, CS (Tshangana, C. S.) [1] ; Nhlengethwa, ST (Nhlengethwa, S. T.) [1] ; Glass, S (Glass, S.) [2] ; Denison, S (Denison, S.) [2] ; Kuvarega, AT (Kuvarega, A. T.) [1] ; Nkambule, TTI (Nkambule, T. T. I.) [1] ; Mamba, BB (Mamba, B. B.) [1] ; Alvarez, PJJ (Alvarez, Pedro J. J.) [2] ; Muleja, AA (Muleja, A. A.) [1] , [2] (provided by Clarivate) **Source NPJ CLEAN WATER Volume 8 Issue 1 DOI 10.1038/s41545-025-00457-3 Article Number 41 Published MAY 15 2025 Indexed 2025-05-21 Document Type Review**

Abstract

Per- and polyfluoroalkyl substances (PFAS) are a class of synthetic chemicals that are highly resistant to degradation because of the strong C-F bond and their unique physico-chemical properties. Several techniques, both destructive and non-destructive, have been explored for removing PFAS from contaminated water. However, the most desirable techniques, ideally capable of effective separation and complete PFAS destruction and mineralization, have not progressed beyond bench-scale testing. This paper provides an overview of the existing treatment techniques demonstrated at laboratory, pilot, and industrial scales, and their associated treatment mechanisms. Insufficient data on pilot-scale and full-scale applications for PFAS remediation has limited the optimization and advancement of these systems at a large scale. Most research related to PFAS-remediation is based on laboratory-scale studies under ideal conditions that do not represent the complexity of PFAS-contaminated media. Factors such as inhibition by competing background compounds and secondary water or air pollution limit the application of some PFAS removal techniques at full-scale. Additionally, high energy intensity, cost, and inappropriate reactor design restrict the scalability of some proposed innovations. Here, we propose integrated systems and treatment trains as potential approaches to effectively remove and destroy PFAS from contaminated waters. This review also offers and contextualizes implementation barriers and scalable approaches for PFAS treatment.

Keywords

Keywords Plus

GRANULAR ACTIVATED CARBONPOLYFLUOROALKYL SUBSTANCES PFASSPERFLUOROOCTANE SULFONATE PFOSPERFLUOROALKYL SUBSTANCESDRINKING-WATERPHOTOCATALYTIC DECOMPOSITIONELECTROCHEMICAL DEGRADATIONPERFLUOROHEXANOIC ACIDPERFLUORINATED COMPOUNDSINITIAL CONCENTRATION

Activated Carbon

3-Photocatalytic Dye Degradation from Textile Wastewater: A Review

By Khan, S (Khan, Sadia) [1] ; Noor, T (Noor, Tayyaba) [1] ; Iqbal, N (Iqbal, Naseem) [2] ; Yaqoob, L (Yaqoob, Lubna) [3] (provided by Clarivate) **Source ACS OMEGA Volume 9 Issue 20 Page 21751-21767 DOI 10.1021/acsomega.4c00887 Published MAY 10 2024 Early Access MAY 2024 Indexed 2024-05-25 Document Type Review**

Abstract

The elimination of dyes discharged from industrial wastewater into water bodies is crucial due to its detrimental effects on aquatic organisms and potential carcinogenic impact on human health. Various methods are employed for dye removal, but they often fall short in completely degrading the dyes and generating large amounts of suspended solids. Hence, there is a critical need for an efficient process that can achieve complete dye degradation with minimal waste emission. Among traditional water treatment approaches, photocatalysis stands out as a promising method for degrading diverse toxic and organic pollutants present in wastewater. In this review, the heterogeneous photocatalysis process is well explained for dye removal. This comprehensive review not only provides insightful illumination on the classification of dyes but also thoroughly explains various dye removal methods and the underlying mechanisms of photocatalysis. Furthermore, factors which effect the activity of the photocatalysis process are also explained in detail. Likewise, we categorized the heterogeneous photocatalyst in three generations and observed their activity for dye removal. This review also addresses the challenges and effectiveness of this promising field. Its primary aim is to offer a comprehensive overview of the photocatalytic degradation of pollution and to explore its potential for further future applications.

Keywords

Keywords Plus

METAL-OXIDEENVIRONMENTAL APPLICATIONSTITANIUM-DIOXIDEACTIVATED CARBONREACTIVE DYESAZO DYESTIO2REMOVALZNONANOPARTICLES

Activated Carbon

4-Recent challenges and development of technical and technoeconomic aspects for hydrogen storage, insights at different scales; A state of art review

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By Mehr, AS (Mehr, Ali Saberi) [1] ; Phillips, AD (Phillips, Andrew D.) [2] ; Brandon, MP (Brandon, Michael P.) [3] ; Pryce, MT (Pryce, Mary T.) [3] ; Carton, JG (Carton, James G.) [4] (provided by Clarivate) **Source INTERNATIONAL JOURNAL OF HYDROGEN ENERGY Volume 70 Page 786-815 DOI 10.1016/j.ijhydene.2024.05.182 Published JUN 12 2024 Early Access MAY 2024 Indexed 2024-06-18 Document Type Review**

Abstract

The importance of the energy transition and the role of green hydrogen in facilitating this transition cannot be denied. Therefore, it is crucial to pay close attention to and thoroughly understand hydrogen storage, which is a critical aspect of the hydrogen supply chain. In this comprehensive review paper, we have undertaken the task of categorising and evaluating various hydrogen storage technologies across three different scales. These scales include small-scale and laboratory-based methods such as metal-based hydrides, physical adsorbents, and liquid organic hydrogen carriers. Also, we explore medium and large-scale approaches like compressed gaseous hydrogen, liquid cryogenic hydrogen, and cryocompressed hydrogen. Lastly, we delve into very large-scale options such as salt caverns, aquifers, depleted gas/oil reservoirs, abandoned mines, and hard rock caverns. We have thoroughly examined each storage technology from technical and maturity perspectives, as well as considering its techno-economic viability. It is worth noting that development has been ongoing for each storage mechanism; however, numerous technical and economic challenges persist in most areas. Particularly, the cost per kilogramme of hydrogen for most current technologies demands careful consideration. It is recommended that small-scale hydrogen storage technologies such as metal hydrides (e.g., MgH2, LiBH4) need ongoing research to enhance their performance. Physical adsorbents have limited capacity except for activated carbon. Some liquid organic hydrogen carriers (LCOHs) are suitable for medium-scale storage in the near term. Ammonia-borane (AB), with its high gravimetric and volumetric properties, is a promising choice for medium-scale storage, pending effective dehydrogenation. It shows potential as a hydrogen carrier due to its high storage capacity, stability, and solubility, surpassing DOE targets for storage capabilities. Medium-scale storage, utilising compressed gas cylinders and advancements in liquefied and cryocompressed hydrogen storage, requires cost reduction measures, and a strategic supply chain. Large-scale storage options include salt caverns, aquifers, and depleted gas/oil reservoirs, with salt caverns offering pure hydrogen, need further technoeconomic analysis and deployment projects to mature, but storage costs are reasonable, ranging mostly from 0.25/kg to 1.5/kg for location specific large-scale options.

Keywords

Author Keywords

Hydrogen storageMetal hydrideCompressed gasLiquified gasGeological storageHydrogen price

Keywords Plus

HYBRID ENERGY SYSTEMSALT CAVERNSECONOMIC-ASSESSMENTDYNAMIC SIMULATIONSEASONAL STORAGEAMMONIA BORANEDEPLETED OILGAS-STORAGENATURAL-GASLIQUID

Activated Carbon

5-Advances in hydrogen storage materials: harnessing innovative technology, from machine learning to computational chemistry, for energy storage solutions

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By Osman, AI (Osman, Ahmed I.) [1] ; Nasr, M (Nasr, Mahmoud) [2] ; Eltaweil, AS (Eltaweil, Abdelazeem S.) [3] ; Hosny, M (Hosny, Mohamed) [4] ; Farghali, M (Farghali, Mohamed) [5] , [6] ; Al-Fatesh, AS (Al-Fatesh, Ahmed S.) [7] ; Rooney, DW (Rooney, David W.) [1] ; El-Monaem, EMA (El-Monaem, Eman M. Abd) [2] (provided by Clarivate) **Source INTERNATIONAL JOURNAL OF HYDROGEN ENERGY Volume 67 Page 1270-1294 DOI 10.1016/j.ijhydene.2024.03.223 Published MAY 20 2024 Early Access MAY 2024 Indexed 2024-06-10 Document Type Article**

Abstract

The demand for clean and sustainable energy solutions is escalating as the global population grows and economies develop. Fossil fuels, which currently dominate the energy sector, contribute to greenhouse gas emissions and environmental degradation. In response to these challenges, hydrogen storage technologies have emerged as a promising avenue for achieving energy sustainability. This review provides an overview of recent advancements in hydrogen storage materials and technologies, emphasizing the importance of efficient storage for maximizing hydrogen ' s potential. The review highlights physical storage methods such as compressed hydrogen (reaching pressures of up to 70 MPa) and material -based approaches utilizing metal hydrides and carboncontaining substances. It also explores design considerations, computational chemistry, high -throughput screening, and machine -learning techniques employed in developing efficient hydrogen storage materials. This comprehensive analysis showcases the potential of hydrogen storage in addressing energy demands, reducing greenhouse gas emissions, and driving clean energy innovation.

Keywords

Author Keywords

Hydrogen storageCompressed hydrogenLiquified hydrogenHigh-throughput screeningComputational chemistryMachine learning

Keywords Plus

COVALENT ORGANIC FRAMEWORKSOF-THE-ARTAMMONIA BORANECOMPLEX HYDRIDESINTRINSIC MICROPOROSITYACTIVATED CARBONSRECENT PROGRESSMETAL-HYDRIDESSALT CAVERNSH-2 STORAGE

Activated Carbon

6-Versatile carbon-based materials from biomass for advanced electrochemical energy storage systems

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By Zhu, ZY (Zhu, Ziyi) [1] ; Men, Y (Men, Yongling) [1] ; Zhang, WJ (Zhang, Wenjia) [1] , [2] ; Yang, WH (Yang, Wenhao) [1] ; Wang, F (Wang, Fei) [1] ; Zhang, YJ (Zhang, Yanjia) [3] ; Zhang, YY (Zhang, Yiyong) [1] ; Zeng, XY (Zeng, Xiaoyuan) [1] ; Xiao, J (Xiao, Jie) [1] ; Tang, C (Tang, Cheng) [4] ;
(provided by Clarivate) Source ESCIENCE Volume 4 Issue 5 DOI 10.1016/j.esci.2024.100249 Article Number e100249 Published OCT 2024 Indexed 2024-10-21 Document Type Review

Abstract

The development of new energy storage technology has played a crucial role in advancing the green and low- carbon energy revolution. This has led to significant progress, spanning from fundamental research to its practical application in industry over the past decade. Nevertheless, the constrained performance of crucial materials poses a significant challenge, as current electrochemical energy storage systems may struggle to meet the growing market demand. In recent years, carbon derived from biomass has garnered significant attention because of its customizable physicochemical properties, environmentally friendly nature, and considerable economic value. This review aims to provide a comprehensive overview of the production-application chain for biomass-derived carbon. It provides a comprehensive analysis of morphology design, structural regulation, and heteroatom-doping modification, and explores the operational mechanisms in different energy storage devices. Moreover, considering recent research progress, the potential uses of biomass-derived carbon in alkali metal-ion batteries, lithium-sulfur

Keywords

Author Keywords

Biomass-derived carbonEnergy storage mechanismsAlkali metal-ion batteriesLithium-sulfur batteriesSupercapacitors

Keywords Plus

HIERARCHICAL POROUS CARBONLITHIUM-SULFUR BATTERIESHIGH-PERFORMANCE SODIUMHARD-CARBONACTIVATED CARBONANODE MATERIALSHIGH-CAPACITYMESOPOROUS CARBONPOTASSIUM-IONOXYGEN REDUCTION

Activated Carbon

7-Comprehensive review on toxic heavy metals in the aquatic system: sources, identification, treatment strategies, and health risk assessment

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By Saravanan, P (Saravanan, Panchamoorthy) [1] ; Saravanan, V (Saravanan, V.) [2] ; Rajeshkannan, R (Rajeshkannan, R.) [2] ; Arnica, G (Arnica, G.) [1] ; Rajasimman, M (Rajasimman, M.) [2] ; Baskar, G (Baskar, Gurunathan) [3] , [4] ; Pugazhendhi, A (Pugazhendhi, Arivalagan) [5] , [6] (provided by Clarivate) **Source ENVIRONMENTAL RESEARCH Volume 258 DOI 10.1016/j.envres.2024.119440 Article Number 119440 Published OCT 1 2024 Early Access JUN 2024 Indexed 2024-11-11 Document Type Review**

Abstract

Heavy metal pollution in water sources has become a major worldwide environmental issue, posing a threat to aquatic ecosystems and human health. The pollution of the aquatic environment is increasing as a result of industrialization, climate change, and urban development. The sources of heavy metal pollution in water include mining waste, leachates from landfills, municipal and industrial wastewater, urban runoff, and natural events such as volcanism, weathering, and rock abrasion. Heavy metal ions are toxic and potentially carcinogenic. They can also buildup in biological systems and cause bioaccumulation even at low levels of exposure, heavy metals can cause harm to organs such as the nervous system, liver and lungs, kidneys and stomach, skin, and reproductive systems. There were various approaches tried to purify water and maintain water quality. The main purpose of this article was to investigate the occurrence and fate of the dangerous contaminants (Heavy metal and metalloids) found in domestic and industrial effluents. This effluent mixes with other water streams and is used for agricultural activities and other domestic activities further complicating the issue. It also discussed conventional and non-conventional treatment methods for heavy metals from aquatic environments. Conclusively, a pollution assessment of heavy metals and a human health risk assessment of heavy metals in water resources have been explained. In addition, there have been efforts to focus on heavy metal sequestration from industrial waste streams and to create a scientific framework for reducing heavy metal discharges into the aquatic environment.

Keywords

Author Keywords

Heavy metalWater resource contaminationToxicityHealth effectsRisk assessmentBioindicators and bioaccumulation

Keywords Plus

DRINKING-WATERINDUSTRIAL WASTEWATERSAQUEOUS-SOLUTIONSORGANIC-COMPOUNDSOXIDATIVE STRESSACTIVATED CARBONHIP-REPLACEMENTREMOVALNICKELEXPOSURE

Activated Carbon

8-Sputtering thin films: Materials, applications, challenges and future directions

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By Garg, R (Garg, Renuka) [1] ; Gonuguntla, S (Gonuguntla, Spandana) [2] , [3] ; Sk, S (Sk, Saddam) [2] , [3] ; Iqbal, MS (Iqbal, Muhammad Saqlain) [4] ; Dada, AO (Dada, Adewumi Oluwasogo) [2] , [5] ; Pal, U (Pal, Ujjwal) [2] , [3] ; Ahmadipour, M (Ahmadipour, Mohsen) [6]
(provided by Clarivate) Source ADVANCES IN COLLOID AND INTERFACE SCIENCE Volume 330 DOI 10.1016/j.cis.2024.103203 Article Number 103203 Published AUG 2024 Early Access MAY 2024 Indexed 2024-06-23 Document Type Review

Abstract

Sputtering is an effective technique for producing ultrathin films with diverse applications. The review begins by providing an in-depth overview of the background, introducing the early development of sputtering and its principles. Consequently, progress in advancements made in recent decades highlights the renaissance of sputtering as a powerful technology for creating thin films with varied compositions, structures, and properties. For the first time, we have discussed a thorough overview of several sputtered thin film materials based on metal and metal oxide, metal nitride, alloys, carbon, and ceramic-based thin film along with their properties and their applicability in various fields. We further delve into the applications of sputter-coated thin films, specifically emphasizing their relevance in environmental sustainability, energy and electronics, and biomedical fields. We critically examine the recent advancements in developing sputter-coated catalysts for eliminating water pollutants andhydrogen generation. Additionally, the review sheds light on advantages, shortcomings, and future directions for developing sputter-coated thin films utilized in biodegradable metals and alloys with enhanced corrosion resistance and biocompatibility. This review is a comprehensive integration of recent literature, covering diverse sputtering thin film applications. We delve deeply into various material types and emphasize critical analysis of recent advancements, particularly in environmental, energy, and biomedical fields. By offering insights into both advancements and limitations, the review provides a nuanced understanding essential for practical utilization.

Keywords

Author Keywords

SputteringUltrathin filmsStructuresPhotocatalystFuel cellBiomedical applications

Keywords Plus

IN-VITRO BIOACTIVITYOXIDE FUEL-CELLSRHODAMINE-B DYEACTIVATED CARBONPHOTOCATALYTIC DEGRADATIONMECHANICAL-PROPERTIESELECTRICAL-PROPERTIESSURFACE MODIFICATIONGRAIN-GROWTHTI-ALLOY

Activated Carbon

9-Modification strategies of TiO_2 based photocatalysts for enhanced visible light activity and energy storage ability: A review

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By Khan, H (Khan, Hayat) [1] , [2] , [3] , [4] ; Shah, MUH (Shah, Mansoor Ul Hassan) [2]
(provided by Clarivate) Source JOURNAL OF ENVIRONMENTAL CHEMICAL ENGINEERING Volume 11 Issue 6 DOI 10.1016/j.jece.2023.111532 Article Number 111532 Published DEC 2023 Early Access NOV 2023 Indexed 2024-01-25 Document Type Review

Abstract

Titanium dioxide (TiO2) as a photocatalyst received remarkable attention owing to its potential applications in environmental remediation and energy production. TiO2 owns an indirect band gap of similar to 3.2 eV, chemical stability, photocorrosion resistant, low toxicity and the photocatalyst is sensitive to ultraviolet (UV) light, which is < 5.0% of the overall solar intensity this is why possesses low quantum efficiency and photocatalytic activity. To increase the photocatalytic performance in the visible light range and to enhance the number of active sites on the material surface to promote its adsorption capacity, also to retard the recombination rate of photoinduced charge carriers and to induce energy storage ability, various modification strategies are used to modify TiO2 structure. Therefore, this work comprehensively reviews the emergence of TiO2 photocatalysis, modification strategies to engineer its wide band gap for the UV-Vis-NIR light range response, the mechanism involved for the electron-hole pairs transport towards pollutant degradation, the photocatalysis process continuation in the absence of light, and the limitation of each of the discussed strategies is reviewed for future research. Lastly, the prospects of the TiO2 modification as a photocatalyst are also projected.

Keywords

Author Keywords

TiO2Visible light photocatalysisCarriers recombinationBand gapPollutant decomposition

Keywords Plus

CO-DOPED TIO2TITANIUM-DIOXIDE PHOTOCATALYSTSLOW-TEMPERATURE SYNTHESISACTIVATED CARBON-FIBERONE-STEP SYNTHESISHIGH-PERFORMANCEBLACK TIO2HYDROGEN-PRODUCTIONNANOCRYSTALLINE TITANIAORGANIC CONTAMINANTS

Activated Carbon

10-Green supercapacitors: Latest developments and perspectives in the pursuit of sustainability

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By Muzaffar, A (Muzaffar, Aqib) [1] ; Ahamed, MB (Ahamed, M. Basheer) [1] ; Hussain, CM (Hussain, Chaudhery Mustansar) [2] (provided by Clarivate) **Source RENEWABLE & SUSTAINABLE ENERGY REVIEWS Volume 195 DOI 10.1016/j.rser.2024.114324 Article Number 114324 Published MAY 2024 Early Access FEB 2024 Indexed 2024-04-28 Document Type Article**

Abstract

The slogans of modern times, "go green," referring to the development of sustainable energy sources, have served as the main pushing force for the exploration of clean and green energy alternatives. Green energy sources are portrayed to limit the worldwide dependency on fossil fuels for energy supply, keeping in view their hazardous impact on the environment. Supercapacitors are electrochemical devices using the principle of electrochemical conversions for energy storage, providing a cleaner, greener and sustainable energy storing and delivering system. However, exploring the design aspects to develop such green energy alternatives remains essential and central. The understanding of designing aspects portrays their applicability. Apart from designing such devices, the green energy or eco-friendliness of such devices prior and after their usage cannot be neglected. The main aim behind exploration of supercapacitors is the elevation of energy density without compromising to the high power density capability. The elevation in energy density of supercapacitors can fill the void between batteries and fuel cells, thereby enabling sustainable energy storing devices. Furthermore, the elevation in specific capacitance to 1000-10000 F for supercapacitors can enhance their applicability in modern times. The enhancements in energy density and specific capacitance can play a vital role in overshadowing the limitations of batteries and fuel cells, thereby marking significance of supercapacitors among the electrochemical energy storing devices. The importance of greener and cleaner energy sources in the development of sustainable energy devices stays fundamental to this review. This review attempts to elaborate on the design aspects of green supercapacitors and the different green materials explored for supercapacitor applications in recent times to compete against the energy storing devices.

Keywords

Author Keywords

SupercapacitorsNanostructured materialsPseudocapacitorSupercapacitor electrodesGreen electrolyte materials

Keywords Plus

HIGH-PERFORMANCE SUPERCAPACITORSHIERARCHICAL POROUS CARBONCO3O4 HOLLOW MICROSPHERESGRAPHENE QUANTUM DOTSACTIVATED CARBONELECTRODE MATERIALANODE MATERIALSELECTROCHEMICAL PERFORMANCEMESOPOROUS CARBONGRAPHITIC CARBON

Activated Carbon

11-Ecological impacts and management strategies of pesticide pollution on aquatic life and human beings

By Abuqamar, SF (Abuqamar, Synan F.) [1] ; El-Saadony, MT (El-Saadony, Mohamed T.) [2] ; Alkafaas, SS (Alkafaas, Samar S.) [3] ; Elsalahaty, MI (Elsalahaty, Mohamed I.) [3] ; Elkafas, SS (Elkafas, Sara S.) [4] , [5] ; Mathew, BT (Mathew, Betty T.) [1] ; Aljasmi, AN (Aljasmi, Amal N.) [1] ; Alhammadi, HS (Alhammadi, Hajar S.) [6] ; Salem, HM (Salem, Heba M.) [7] ; El-Mageed, TAA (El-Mageed, Taia A. Abd) [8] ; **(provided by Clarivate) Source MARINE POLLUTION BULLETIN Volume 206 DOI 10.1016/j.marpolbul.2024.116613 Article Number 116613 Published SEP 2024 Early Access JUL 2024 Indexed 2024-08-10 Document Type Review**

Abstract

Pesticide contamination has become a global concern. Pesticides can sorb onto suspended particles and deposit into the sedimentary layers of aquatic environments, resulting in ecosystem degradation, pollution, and diseases. Pesticides impact the behavior of aquatic environments by contaminating organic matter in water, which serves as the primary food source for aquatic food webs. Pesticide residues can increase ammonium, nitrite, nitrate, and sulfate in aquatic systems; thus, threatening ecological environment and human health. Several physical, chemical, and biological methodologies have been implemented to effectively remove pesticide traces from aquatic environments. The present review highlights the potential consequences of pesticide exposure on fish and humans, focusing on the (epi)genetic alterations affecting growth, behavior, and immune system. Mitigation strategies (e.g., bioremediation) to prevent/minimize the detrimental impacts of pesticides are also discussed. This review aims to shed light on the awareness in reducing the risk of water pollution for safe and sustainable pesticide management.

Keywords

Author Keywords

Aquatic lifeBioremediationEcotoxicityPersistent organic pollutantsSustainabilityWater contamination

Keywords Plus

FRESH-WATER FISHORGANOCHLORINE PESTICIDESPOLYCHLORINATED-BIPHENYLSAGRICULTURAL SOILSHUMAN HEALTHORGANOPHOSPHATE PESTICIDEHISTOPATHOLOGICAL CHANGESATRAZINE EXPOSUREACTIVATED CARBONTOXICITY

Activated Carbon

12-An overview of technologies for capturing, storing, and utilizing carbon dioxide: Technology readiness, large-scale demonstration, and cost

By Baskaran, D (Baskaran, Divya) [1] , [4] ; Saravanan, P (Saravanan, Panchamoorthy) [2] ; Nagarajan, L (Nagarajan, L.) [3] ; Byun, HS (Byun, Hun-Soo) [1] (provided by Clarivate) **Source CHEMICAL ENGINEERING JOURNAL Volume 491 DOI 10.1016/j.cej.2024.151998 Article Number 151998 Published JUL 1 2024 Early Access MAY 2024 Indexed 2024-08-13 Document Type Review**

Abstract

Concerns are growing regarding the impact of human-caused CO2 emissions on global warming, which is directly linked to climate change. To achieve carbon neutrality, we must prioritize the development of technologies that capture, store, and use CO2. This review provides an updated overview of the technologies for carbon capture, storage, and utilization (CCUS). It focuses on technology readiness, cost analysis, and large-scale facility demonstrations. A deep insight has been conducted into the state-of-the-art of pre-, oxy-fuel, post-, and chemical looping combustion technologies. Geological storage and dynamic models as well as seepage investigations for storing captured carbon are detailed. Furthermore, we explained how waste CO2 can be utilized in industrial processes and discussed the current development stages of these technologies. We also analyzed the stages of various carbon capture technologies based on their technology readiness levels. While reutilizing emitted CO2 can contribute to a circular economy, some technologies may not be economically profitable. The potential challenges and obstacles associated with implementing CCUS facilities on a larger scale are addressed. The review confirms that the cost of CO2 utilization is higher than the capture cost. For the first time, we elucidated the environmental impact of CCUS, and the risks and safety associated with the transportation and storage of CO2. Machine learning algorithms are crucial in CCUS research, but they require appropriate selection and combination for optimal results. This review is a valuable reference point for recent advances in carbon capture and will help understand the CCUS process and future needs.

Keywords

Author Keywords

Carbon dioxidePost-combustionGeological storageUtilization pathwayTechnology readiness levelCarbon capture and utilization cost

Keywords Plus

CO2 CAPTUREACTIVATED CARBONFLUE-GASWASTE-WATERBIODIESEL PRODUCTIONSUGARCANE BAGASSEPOROUS CARBONPOWER-PLANTRICE HUSKADSORPTION

Activated Carbon

13-Advanced strategies in electrode engineering and nanomaterial modifications for supercapacitor performance enhancement: A comprehensive review

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By Shah, SS (Shah, Syed Shaheen) [1] ; Niaz, F (Niaz, Falak) [2] ; Ehsan, MA (Ehsan, Muhammad Ali) [3] ; Das, HT (Das, Himadri Tanaya) [4] ; Younas, M (Younas, Muhammad) [5] ; Khan, AS (Khan, Amir Sohail) [6] ; Rahman, HU (Rahman, Haroon Ur) [7] ; Abu Nayem, SM (Abu Nayem, S. M.) [8] ; Oyama, M (Oyama, Munetaka) [1] ; Aziz, MA (Aziz, Md. Abdul) [3] **(provided by Clarivate) Source JOURNAL OF ENERGY STORAGE Volume 79 DOI 10.1016/j.est.2023.110152 Article Number 110152 Published FEB 15 2024 Early Access DEC 2023 Indexed 2024-02-05 Document Type Review**

Abstract

Supercapacitors are rapidly emerging as a pivotal energy storage technology due to their high-power density, fast charging/discharging capabilities, and long cyclic life. This extensive review sheds light on the integral components of supercapacitors, emphasizing electrode materials and the diverse substrates they are interfaced with. The careful selection of appropriate electrode materials, along with their preparation and coating techniques on compatible substrates, significantly influences the performance and cost of supercapacitors. Recent research efforts have focused on enhancing supercapacitor performance by modifying various substrates with nano -materials. This review covers a range of supercapacitor substrates, including carbon-based substrates, indium tin oxide-coated glass, fluorine-doped tin oxide-coated glass, nickel foam, stainless steel, and aluminum foil, dis-cussing their modification with various nanomaterials such as carbon-based materials, metal oxides, metal hydroxides, metal sulfides, MOFs, COFs, MXenes, and conductive polymers. Techniques such as drop casting, electrochemical deposition, hydrothermal methods, and printing techniques are utilized for these modifications. The advantages and disadvantages of each substrate and modification process are examined, focusing on how nanomaterials impact energy storage capacity, power density, and cycling stability. Using nanomaterials in-creases electrode surface area, leading to higher energy density, while suitable substrates facilitate precise control over nanomaterial modifications, resulting in improved charge storage capabilities. By providing insights into the fundamental knowledge of supercapacitors and emphasizing the potential of nanomaterials and their modification methodologies on various substrates, this review paper offers valuable information for scientists and engineers in the field of energy storage.

Keywords

Author Keywords

Electrodes development methodsNanomaterialsSynthesis protocolsSubstratesSupercapacitors

Keywords Plus

CHEMICAL-VAPOR-DEPOSITIONLAYERED DOUBLE HYDROXIDEMETAL-ORGANIC FRAMEWORKWALLED CARBON NANOTUBESPOLYANILINE THIN-FILMSGRAPHENE OXIDE SHEETSBORON-DOPED DIAMONDNI-FOAM SUBSTRATEACTIVATED CARBONFLEXIBLE SUPERCAPACITOR

Activated Carbon

14- Modulating the d-Band Center Enables Ultrafine Pt_3Fe Alloy Nanoparticles for pH-Universal Hydrogen Evolution Reaction

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By Kuang, PY (Kuang, Panyong) [1] ; Ni, ZR (Ni, Zhenrui) [1] ; Zhu, BC (Zhu, Bicheng) [1] ; Lin, Y (Lin, Yue) [2] ; Yu, JG (Yu, Jiaguo) [1] (provided by Clarivate) **Source ADVANCED MATERIALS Volume 35 Issue 41 DOI 10.1002/adma.202303030 Article Number 2303030 Published OCT 2023 Indexed 2024-02-29 Document Type Article**

Abstract

By providing dual active sites to synergistically accelerate H2O dissociation and H+ reduction, ordered intermetallic alloys usually show extraordinary performance for pH-universal hydrogen evolution reaction (HER). Herein, activated N-doped mesoporous carbon spheres supported intermetallic Pt3Fe alloys (Pt3Fe/NMCS-A), as a highly-efficient electrocatalyst for pH-universal HER, are reported. The Pt3Fe/NMCS-A exhibits low overpotentials (eta(10)) of 13, 29, and 48 mV to deliver 10 mA cm(-2) in 0.5 m H2SO4, 1.0 m KOH, and 1.0 m phosphate buffered solution (PBS), respectively, as well as robust stability to maintain the overall catalytic performances. Theoretical studies reveal that the strong Pt 5d-Fe 3d orbital electronic interactions negatively shift the d-band center (epsilon(d)) of Pt 5d orbital, resulting in reduced H* adsorption energy of Pt sites and enhanced acidic HER activity. With Pt and Fe acting as co-adsorption sites for H* and *OH intermediates, respectively, a low energy barrier is required for Pt3Fe/NMCS-A to dissociate H2O to afford H* intermediates, which greatly promotes the H* adsorption and H-2 formation in alkaline and neutral conditions. The synthetic strategy is further extended to the synthesis of Pt3Co and Pt3Ni alloys with excellent HER activity in pH-universal electrolytes, demonstrating the great potential of these Pt-based alloys for practical applications.

Keywords

Author Keywords

d-band centerhydrogen evolution reactionintermetallic Pt3Fe alloyspH-universal electrolytesstrong d-d orbital electronic interactions

Keywords Plus

ROBUST ELECTROCATALYSTOXYGEN REDUCTIONHIGHLY EFFICIENTPLATINUMENERGYCOMPOSITECATALYSTS

Activated Carbon

15-Innovative molten salt techniques for biomass valorization: Transforming biomass into advanced carbon materials

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By Wang, F (Wang, Fan) [1] ; Qi, XT (Qi, Xingtao) [1] , [2] ; Zhang, H (Zhang, Hai) [1] ; Yang, ZY (Yang, Zhenyu) [1] , [2] **(provided by Clarivate) Source CARBON Volume 234 DOI 10.1016/j.carbon.2025.119999 Article Number 119999 Published MAR 5 2025 Early Access JAN 2025 Indexed 2025-01-21 Document Type Article**

Abstract

The conversion of biomass into high-value carbon materials presents significant opportunities for sustainable development in energy storage, catalysis, and environmental applications. Biomass, with its renewability and abundant carbon content, offers a valuable raw material source. This review focuses on the innovative use of molten salt-mediated thermochemical conversion (MSMTC) techniques, coupled with electrochemical approaches, to transform biomass into functional carbon materials. Molten salts serve as heat carriers, catalysts, and solvents, providing multiple benefits: high thermal efficiency, catalytic promotion, and customizable compositions for specific reactions. They also enable electro-deoxygenation and graphitization, improving the conductivity of biomass-derived carbon, while offering a sustainable and cleaner conversion process. Recent advances in MSMTC for producing graphite, carbon nanotubes, carbon nanosheets, graphene, carbon black, and porous carbon materials from biomass are comprehensively discussed. This review delves into the mechanisms, synthetic routes, and potential applications of MSMTC, highlighting its industrialization prospects and contribution to achieving a circular economy. By addressing the challenges and innovations in this field, the review aims to provide a thorough understanding of MSMTC's role in biomass valorization and its future potential.

Keywords

Author Keywords

BiomassMolten saltsValorizationAdvanced carbon materials

Keywords Plus

DOPED POROUS CARBONELECTROCHEMICAL GRAPHITIZATIONLIGNOCELLULOSIC BIOMASSCRYSTALLINE GRAPHITEAMORPHOUS CARBONSACTIVATED CARBONLOW-TEMPERATUREIN-SITUCONVERSIONPYROLYSIS

Activated Carbon

16-Recent developments in transition metal oxide-based electrode composites for supercapacitor applications

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By Ahmad, F (Ahmad, Farooq) [1] , [2] ; Shahzad, A (Shahzad, Amir) [3] ; Danish, M (Danish, Muhammad) [4] ; Fatima, M (Fatima, Mariam) [2] ; Adnan, M (Adnan, Muhammad) [2] ; Atiq, S (Atiq, Shahid) [2] ; Asim, M (Asim, Muhammad) [5] ; Khan, MA (Khan, Muhammad Ahmed) [2] ; Ul Ain, Q (Ul Ain, Qurat) [1] ; Perveen, R (Perveen, Riffat) [4] **(provided by Clarivate) Source JOURNAL OF ENERGY STORAGE Volume 81 DOI 10.1016/j.est.2024.110430 Article Number 110430 Published MAR 15 2024 Early Access JAN 2024 Indexed 2024-03-02 Document Type Review**

Abstract

Supercapacitors (SCs) possess the capacity to function as fundamental electrochemical storage technology inside intermittent renewable energy sources, effectively mitigating the disparity between batteries and conventional capacitors. Considerable investigation has been undertaken into electrode materials from transition metals oxide (TMO) composites to explore their potential value in the SCs field. However, it is essential to acknowledge that these materials have limitations, including the hindered transport of electrons and ions and subpar electronic conductivity. The limitations mentioned above provide substantial obstacles to the electrochemical efficacy of these materials within the context of energy storage applications. The advancement of electrode materials developing transition metals is of dominant significance in attaining elevated energy density, enhanced specific power, and accelerated charging/discharging rates. Consequently, this enhances the overall efficacy of SCs. This review objectives to give a comprehensive summary of the recent progress made in electrode materials, specifically TMO composites. The primary objective of this study is to analyze and evaluate the diverse morphologies, components, and power characteristics linked to these materials. Furthermore, our study provides valuable insights into the potential of TMO-based hybrid electrode materials in SCs. The objective is to enhance their performance and promote their adoption of extensive energy storage and conversion applications. This review aims to contribute to the progress of these materials and their potential prospects in the field.

Keywords

Author Keywords

SupercapacitorsElectrode materialsCompositesTMOElectrochemical devices

Keywords Plus

CORE-SHELL STRUCTUREHIGH-PERFORMANCEGRAPHENE OXIDETHIN-FILMSZNO NANOPARTICLESASYMMETRIC SUPERCAPACITORCO3O4 NANOPARTICLESHYDROTHERMAL METHODCARBON NANOFIBERSACTIVATED CARBON

Activated Carbon

17-Unveiling cutting-edge advances in high surface area porous materials for the efficient removal of toxic metal ions from water

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By Mane, PV (Mane, Padmaja, V) [1] ; Rego, RM (Rego, Richelle M.) [1] ; Yap, PL (Yap, Pei Lay) [2] ; Losic, D (Losic, Dusan) [2] ; Kurkuri, MD (Kurkuri, Mahaveer D.) [1] (provided by Clarivate) **Source PROGRESS IN MATERIALS SCIENCE Volume 146 DOI 10.1016/j.pmatsci.2024.101314 Article Number 101314 Published DEC 2024 Early Access JUN 2024 Indexed 2024-06-29 Document Type Review**

Abstract

This review offers a comprehensive evaluation of an emerging category of adsorbing materials known as high surface area materials (HSAMs) in the realm of water remediation. The objective is to shed light on recent advancements in HSAMs featuring multiple dimensionalities, addressing their efficacy in adsorbing toxic metal ions from wastewater. The spectrum of HSAMs examined in this review encompasses metal-organic frameworks (MOFs), covalent organic frameworks (COFs), carbon-based porous materials, mesoporous silica, polymer-based porous materials, layered double hydroxides, and aerogels. This review delves into the state-of-the-art design and synthetic approaches for these materials, elucidating their inherent properties. It particularly emphasizes how the combination of high surface area and pore structure contributes to their effectiveness in adsorbing toxic metal ions. These materials possess remarkable attributes, including molecular functionalization versatility, high porosity, expansive surface area, distinctive physicochemical characteristics, and well-defined crystal structures, rendering them exceptional adsorbents. While each of these materials boasts unique advantages stemming from their remarkable properties, their synthesis often entails intricate and costly procedures, presenting a substantial obstacle to their commercialization and widespread adoption. Finally, the review underscores the existing challenges that must be addressed to expedite their translation for water remediation applications of these promising materials.

Keywords

Author Keywords

High surface area materialsPorous materialsWater treatmentAdsorptionMetal ions

Keywords Plus

MESOPOROUS SILICA NANOPARTICLESCOVALENT ORGANIC FRAMEWORKSLAYERED DOUBLE HYDROXIDESECONDARY BUILDING UNITSPORE-SIZE DISTRIBUTIONCARBON-BASED MATERIALSAQUEOUS-SOLUTIONACTIVATED CARBONHEAVY-METALSSYNTHESIS STRATEGIES

Activated Carbon

18-Removal and degradation of dyes from textile industry wastewater: Benchmarking recent advancements, toxicity assessment and cost analysis of treatment processes

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By Sahu, A (Sahu, Abhispa) [1] ; Poler, JC (Poler, Jordan C.) [2] (provided by Clarivate) Source JOURNAL OF ENVIRONMENTAL CHEMICAL ENGINEERING Volume 12 Issue 5 DOI 10.1016/j.jece.2024.113754 Article Number 113754 Published OCT 2024 Early Access AUG 2024 Indexed 2024-09-10 Document Type Article

Abstract

Clean and safe drinking water is vital. Tragically, this quality has been degraded due to the anthropomorphic and continuous discharge of toxic and non-biodegradable organic pollutants into the aquatic environment. Among the many sources of water pollution, the textile industry has become a major problem as wastewater containing dyes is often discharged into natural water bodies. Studies have shown that a major portion (similar to 20 %) of dyes is lost during synthesis and processing operations and end up in wastewater. Due to their ubiquitous industrial use, textile dyes are categorized as pollutants of major concern, posing an ongoing threat worldwide. The discharge of dyes and/or their degradation byproducts in the aquatic environment poses serious health risks to aquatic plants, organisms, and humans, making it necessary to remove them at their source. This review article aims to present and discuss the most advanced and state-of-art technical and scientific developments in the removal and degradation of dyes from textile wastewater. This review discusses the emergence of the latest nanomaterials, current focus, and superior efficiencies of the state-of-the-art materials, with emphasis on physical and chemical approaches. By comparing frequently studied treatment methods for cost and efficiency, the future outlook provides insights into selection of treatment options, knowledge gaps, and how to improve the efficiency of applicable systems. This feasibility analysis will help readers select the most efficient treatment process from both a performance and financial perspective. While multistage hybrid technologies are worth pursuing, few technologies such as ozonation and photo-Fenton have emerged as promising independent processes. Their individual combination with filtration methods has the ability to provide an economically feasible and time-efficient solution. However, there is room for further improvement in developing or tailoring models, methods and processes that target not only dyes but also secondary factors (such as chemical oxygen demand), while remaining cost-effective and affordable for all parts of the world.

Keywords

Author Keywords

Dye removal and degradationTextile dyes wastewater treatmentPhysical approachChemical degradationBiological remediation processesOperational cost analysis

Keywords Plus

ADVANCED OXIDATION PROCESSESSOLAR PHOTOELECTRO-FENTONWHITE-ROT FUNGIAZURE-B DYEMALACHITE GREENACTIVATED CARBONAQUEOUS-SOLUTIONMETHYLENE-BLUEELECTRO-FENTONREACTIVE DYES