

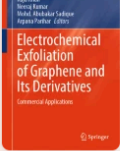
Electrochemistry and Energy Storage Applications of Graphene and Its Derivatives

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Chapter | First Online: 21 May 2024
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Electrochemical Exfoliation of Graphene and Its Derivatives

Gaurav Tatrari , Mayank Pathak, Diksha Bhatt, Kamal Garwal, Faiz Ullah Shah & Nanda Gopal Sahoo

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Abstract

The energy demand cannot be fully accomplished as the rate of increasing worldwide population is larger than the production of energy. The increasing population also leads to the development of more electrical components, which need a lot of energy to store, so energy storing devices are the need of the hour. Batteries and supercapacitors are the main class of such energy storage devices. Graphene is a 2D nanomaterial suitable for energy storage devices as electrode material due to its remarkable properties like high theoretical specific surface area and high electrical conductivity. Still, scientific works are underway to

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Selected contributions in advanced batteries, accumulators, and fuel cells

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Selected contributions in advanced batteries, accumulators, and fuel cells


Foreword | Published: 27 March 2024
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Brno University of Technology, Faculty of Electrical Engineering and Communication, has been involved in the research of materials for electrochemical power sources for more than 50 years. In connection with these research activities, the *Department of Electrical and Electronic Technology* initiated in the year 2000 a series of internationally oriented conferences under the name “*Advanced Batteries, Accumulators, and Fuel Cells*”. They focus on advances in science and technology in the field of electrochemical processes and energy storage (batteries, accumulators, supercapacitors, and fuel cells), energy generation from renewable sources, photovoltaic systems, nanomaterials for electrochemical power sources, and aspects of corrosion. Every year, the latest discoveries and trends are added to the conference program.

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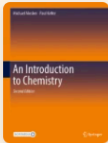
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Abstract

Electrochemistry concerns the electron exchanges that occur in chemical reactions. Understanding the theory and wide-ranging applications of electrochemistry allows us to dive into reduction and oxidation reactions, the relationship of electron exchange to thermodynamics, especially free energy, how electron exchange is related to the concentration of reactants, and how we can change the reaction conditions to generate electricity for uses as varied as heart pacemakers and batteries for electric vehicles.

Teaching electrochemistry and student participation in the development of sustainable electricity generation/storage devices at the Institute of Chemistry of the University of Tartu


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Teaching electrochemistry and student participation in the development of sustainable electricity generation/storage devices at the Institute of Chemistry of the University of Tartu

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Abstract

Research-based education is a long-standing tradition at the University of Tartu (UT). Basic knowledge of electrochemistry and the principles of developing electrochemical devices have been taught and implemented at UT since 1960. For instance, during then, self-made alkaline electrolyzers were used to generate hydrogen. The hydrogen was further purified and used to saturate aqueous and non-aqueous electrolytes. The

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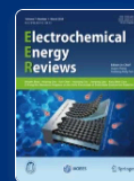
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Solid-State Electrochemistry and Solid Oxide Fuel Cells: Status and Future Prospects


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Solid-State Electrochemistry and Solid Oxide Fuel Cells: Status and Future Prospects

Review article | Open access | Published: 07 November 2022

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Electrochemical Energy Review

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Abstract

Solid-state electrochemistry (SSE) is an interdisciplinary field bridging electrochemistry and solid-state ionics and deals primarily with the properties of solids that conduct ions in the case of ionic conducting solid electrolytes and electrons and/or electron holes in the case of mixed ionic and electronic conducting materials. However, in solid-state devices such as solid oxide fuel cells (SOFCs), there are unique electrochemical features due to the high operating temperature (600–1 000 °C) and solid electrolytes and electrodes. The solid-to-solid contact at the electrode/electrolyte interface is one of the most distinguished features of SOFCs and is one of the fundamental reasons for the occurrence of most importance phenomena such as shift of the equipotential lines, the constriction effect, polarization-induced interface formation, etc. in SOFCs. The restriction in placing the reference electrode in solid electrolyte cells further complicates the SSE in SOFCs. In

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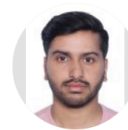
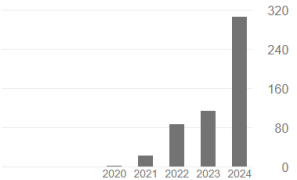
Energy Storage Devices Electrolyte Development Electrode Modification Waste Management Graphene

TITLE	CITED BY	YEAR
Solid waste-derived carbon nanomaterials for supercapacitor applications: a recent overview G Tatrari, M Karakoti, C Tewari, S Pandey, BS Bohra, A Dandapat, ... Materials Advances 2 (5), 1454-1484	70	2021
A simple, eco-friendly and green approach to synthesis of blue photoluminescent potassium-doped graphene oxide from agriculture waste for bio-imaging applications C Tewari, G Tatrari, M Karakoti, S Pandey, M Pal, S Rana, ... Materials Science and Engineering: C 104, 109970	41	2019
A waste to energy approach for the effective conversion of solid waste plastics into graphene nanosheets using different catalysts for high performance supercapacitors: a ... M Karakoti, S Pandey, G Tatrari, PS Dhapola, R Jangra, S Dhali, ... Materials Advances 3 (4), 2146-2157	38	2022

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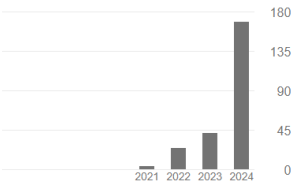
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A waste to energy approach for the effective conversion of solid waste plastics into graphene nanosheets using different catalysts for high performance supercapacitors: a ... M Karakoti, S Pandey, G Tatrari, PS Dhapola, R Jangra, S Dhali, ... Materials Advances 3 (4), 2146-2157	38	2022
Mass production of metal-doped graphene from the agriculture waste of Quercus ilex leaves for supercapacitors: inclusive DFT study G Tatrari, C Tewari, M Karakoti, M Pathak, R Jangra, B Santhibhushan, ... RSC advances 11 (18), 10891-10901	28	2021
High energy density supercapacitors: an overview of efficient electrode materials, electrolytes, design, and fabrication M Pathak, D Bhatt, RC Bhatt, BS Bohra, G Tatrari, S Rana, MC Arya, ... The Chemical Record 24 (1), e202300236	25	2024

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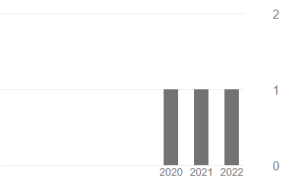
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TITLE	CITED BY	YEAR
A study of Indian banking sector P Antil, P Antil, K Agarwal International Journal of Multidisciplinary Research and Development 4 (6 ...	4	2017
"Are they Financially well ? Decoding Financial Well Being of Indian Gig Workers " RAA.Kamal , Sharma Vaibhav Empirical Economics Letters,20 (Special Issue) 22 (2), 1-12		2023
FINTECH IN INDIA: - OPPORTUNITIES AND THREATS B Saluja, K Agarwal, YVR Murthy Journal of the Oriental Institute 71 (03), 57-61		2022
GREEN BANKING BENEFITS AND CHALLENGES S Gupta, K Agarwal, YVR Murthy JOURNAL OF MANAGEMENT & ENTREPRENEURSHIP 16 (2), 53-56		2022

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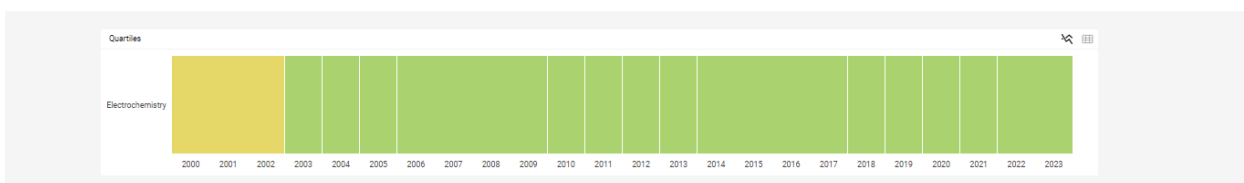
Electrochemistry Communications

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United States	Chemistry ↳ Electrochemistry	Elsevier Inc.	213
Universities and research institutions in United States			
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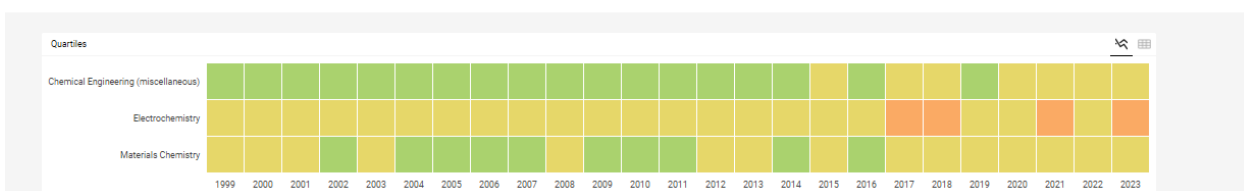
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Netherlands	Chemical Engineering ↳ Chemical Engineering (miscellaneous) Chemistry ↳ Electrochemistry Materials Science ↳ Materials Chemistry	Springer Netherlands	126
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Journals	15675394, 1878562X	2000-2024	<p>Homepage</p> <p>How to publish in this journal</p>

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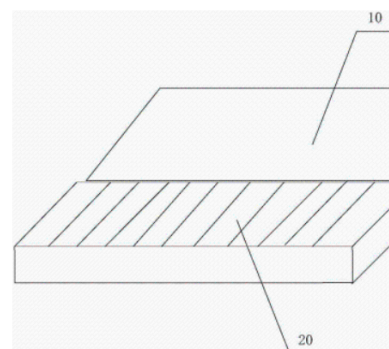
An International Journal Devoted to Electrochemical Aspects of Biology and Biological Aspects of Electrochemistry Bioelectrochemistry is an international journal devoted to electrochemical principles in biology and biological aspects of electrochemistry. It publishes experimental and theoretical papers dealing with the electrochemical aspects of: • Electrified interfaces (electric double layers, adsorption, electron transfer, protein electrochemistry, basic principles of biosensors, biosensor interfaces and bio-nanosensor design and construction. • Electric and magnetic field effects (field-dependent processes, field interactions with molecules, intramolecular field effects, sensory systems for electric and magnetic fields, molecular and cellular mechanisms) • Bioenergetics and signal transduction (energy conversion, photosynthetic and visual membranes) • Biomembranes and model membranes (thermodynamics and mechanics, membrane transport, electroporation, fusion and insertion) • Electrochemical applications in medicine and biotechnology (drug delivery and gene transfer to cells and tissues, iontophoresis, skin electroporation, injury and repair). • Organization and use of arrays in-vitro and in-vivo, including as part of feedback control. • Electrochemical interrogation of biofilms as generated by microorganisms and tissue reaction associated with medical implants.

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1	Lead powder electrochemistry testing arrangement suitable for lead-acid batteries	CN205691535	2016-06-07	HUAZHONG ...	100 %
2	Electrochemistry comprehensive tester	CN207007880	2017-04-21	HUNAN UNIV. ...	96 %
3	An apparatus for in situ observation and measurement of electrochemistry	CN212275654	2020-04-14	QINGDAO IN. ...	96 %
4	Method for preparing graphene powder by electrochemistry	CN102534642	2011-12-23	BTR NEW MA. ...	96 %
5	Method for preparing phosphene by utilizing electrochemistry	CN104779380	2015-04-10	SHANDONG ...	95 %
6	Battery pack life prediction method based on electrochemistry-thermal-aging and three-dimensional order reduction	CN115453377	2022-11-11	TIANMU LAK. ...	94 %
7	Method for recovering waste electrode material by coupling in-situ thermal reduction with electrochemistry	CN118186214	2024-03-15	CHINA UNIVE. ...	93 %
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9	Energy generation from fabric electrochemistry	EP3589148	2018-03-02	OHIO STATE I. ...	93 %
10	Electrochemistry employing polyaniline	US5023149	1985-06-13	UNIVERSITY ...	93 %
11	Secondary batteries electrochemistry performance test apparatus	CN201110889	2007-09-29	BYD	93 %
12	Electrode for electrochemistry element and electrochemistry element using it	JP2004259652	2003-02-27	PANASONIC	92 %
13	Method for effectively screening discharged batteries	CN105598044	2015-12-02	HANGZHOU ...	92 %
14	Improved composite layers or separators for lead acid batteries	EP3596763	2018-03-09	DARAMIC	92 %
15	Calcium salt for calcium batteries	US12046716	2019-11-25	ARIZONA STA. ...	91 %
16	Cellulose-based separators comprising flame retardant, and uses thereof in electrochemistry	EP3924448	2019-02-15	HYDRO QUEBEC	91 %
17	Electrolyte for electrochemistry device, and electrochemistry device using the same	JP2007088359	2005-09-26	JAPAN CARLIT	91 %

Electrochemistry comprehensive tester



Protected countries

Granted: CN

List of publications

Publication number: 201704211878562X Date: 2017-04-21

Translate

Multi-electrode microbial fuel cell system for researching microbial electrochemistry

Abstract

The invention belongs to the field of microbial **electrochemistry**, and specifically relates to a multi-electrode microbial **fuel** cell system for researching the microbial **electrochemistry**. The multi-electrode microbial **fuel** cell system comprises a matrix storage tank, a peristaltic pump, a cylinder microbial **fuel** cell, anode electrodes, a cathode electrode, a data collecting card, a load resistor, a data recording and analyzing device, a three-electrode system and an electrochemical workstation. The cylinder microbial **fuel** cell comprises a cylinder shell, an anode chamber inside the shell, a cathode chamber and a proton exchange membrane. When an **electrochemistry** test is carried out, the three-electrode system is formed by employing the anode electrodes as working electrodes, and analysis is carried out by the electrochemical workstation. The invention provides a device for directly researching electricigens and a method for researching the electricigens. Microbes are prevented from being damaged by utilizing the method and the device. The method and the device are simple and convenient, so that analysis errors due to microbe transfer by prior methods are prevented, and **electrochemistry** characteristics of the electricigens can be really reflected. The multi-electrode microbial **fuel** cell system provided by the invention has a certain application value.

Protected countries
Granted: CN

List of publications

Application number: 2013CN-0195986 Date: 2013-05-23 Register

Publication	Publication date
CN103326053 B - Granted patent for invention	2015-05-13
CN103326053 A - Published application	2013-09-25

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Priority Numbers & Dates
2013CN-0195986 2013-05-23

Technology domain
Electrical machinery, apparatus, energy

IPC codes
 H01M-004/86 H01M-008/16

CPC codes
 Y02E-060/50

Cited Patents
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-US2010239920 (A1) (Cat. A) [US20100239920] SEFTON BRIAN; -CN100344025 (C) (Cat. Y) [CN100344025C] KOREA INST SCI & TECH; -CN102437360 (A) (Cat. A) [CN102437360] UNIV SHENYANG JIANZHU;
-US2011097605 (A1) (Cat. A) [US2011097605] GANGULI RAHUL et al; -CN101216411 (A) (Cat. Y) [CN101216411] UNIV BEIJING SCIENCE & TECH.

Вывод:

Поиск на английском языке дал намного больше источников и статей, касающихся электрохимии в сфере энергии, включая батареи и топливные элементы, причём в разных отраслях науки и технологий. За рубежом использование передовых методов, таких как искусственный интеллект, для разработки и оптимизации электрохимических процессов в энергетике является более востребованной темой, чем у нас. Это подтверждается количеством опубликованных исследований и уровнем интереса к ним. Можно заключить, что для данной темы целесообразнее проводить поиск на английском языке, так как она является актуальной и активно исследуемой в настоящее время.