

Mariusz Walkowiak



Personal data Associate Professor

Institute of Non-Ferrous Metals Division in Poznań
Central Laboratory of Batteries and Cells
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Research interests

sustainable energy, nanomaterials, nanotechnology, energy conversion and storage, polymer-ceramic nanocomposites, composite polymer and gel electrolytes, graphene and its composites, Li-ion batteries, lithium-sulfur (Li-S) batteries, electrochemical capacitors, dye-sensitized solar cells

Education and titles

2017

Habilitation

Poznan University of Technology for the work *“Studies on the application of selected silicon compounds as functional electrolyte additives for energy storage devices”*

2010 – 2012

Executive MBA degree (2012)

Aalto University School of Business (Helsinki) & Poznan School of Banking

2006

PhD degree

Poznan University of Technology, Faculty of Chemical Technology, doctoral studies Chemical Technology, thesis *“Modification and properties of graphite electrode materials for lithium-ion cells”*

1997 – 2001

Poznan University of Technology, Faculty of Chemical Technology, doctoral studies Chemical Technology

1991 - 1997

MSc degree (1997)

Poznan University of Technology, Faculty of Chemical Technology, specialty: Electrochemical Power Sources; thesis *“Modification and properties of graphite bi-intercalation compounds”*

Employment at Institute of Non-Ferrous Metals Division in Poznan Central Laboratory of Batteries and Cells

2017 - present Associate Professor (having formally fulfilled the conditions of habilitation)

2010 - present Head of Department of Advanced Materials

2002 - 2010 Head of Lithium Batteries Laboratory

2006 - present Adjunct

1997 - present Employment at Institute of Non-Ferrous Metals Division in Poznan (former Central Laboratory of Batteries and Cells)

Major responsibilities: Research on advanced materials for energy conversion and storage, administration of the Department, planning and managing statutory activities of the Department, preparing grant proposals, managing research projects, representing the Institute during domestic and international events, proof-reading and consulting of official English-language documents, activities in the field of battery standardization, expert work (including evaluation of proposal and reviewing manuscripts)

Other relevant professional experience (including evaluations)

Evaluations Evaluator of FP7 project proposals for the European Commission (three calls: 2010, 2013, 2016)
Evaluator of project proposals for the Ministry of Science and Higher Education of Poland (from 2009)
Project evaluator for the Technology Agency of the Czech Republic (2013) – Competence Centres Programme

Membership Member of the Technical Committee No 54 for Electrochemical Power Sources at Polish Committee for Standardization
Member of Technical Committee 35 at International Electrochemical Committee
Member of International Society of Electrochemistry
Member of The Electrochemical Society
Member of Editorial Advisory Board in The Open Energy and Fuel Science Journal

Other Polish expert taking part in works of the WS10 EG4 working group (batteries) of European Standardization Committee – preparation of The European Handbook of Defence Procurement (2005-2006)
Associate Editor in Frontiers in Energy Storage

Research projects

1. Bilateral Polish-Czech project “Materials for low-temperature fuel cells and lithium-ion cells with polymer electrolytes” – **head of the Polish group**
2. KBN Research Grant No 3 T10A 015 27 “Effect of silica modified with silanes on the characteristics of composite gel electrolyte for new generation of lithium-ion batteries” – **head of the project**
3. Polish Ministry of Science and Higher Education Special Grant No ERA-NET MNT/93/22006 “Nano-engineering of electrode/electrolyte interface in lithium-ion cells with the application of supramolecular silicon compounds” - head of the project (The project is part of international MNT ERA-Net project NANOLION “Nanostructured materials development for advanced Li-ion batteries”)
4. Polish Ministry of Science and Higher Education Grant No N205 020 32 “Podand-type macromolecular compounds as nano-functional electrolyte components for the new generation of Li-ion batteries” - **member of the project**
5. Polish Ministry of Science and Higher Education Grant No N N205 017534 “Effect of fillers modified with acidic groups on the electrochemical characteristics of gel electrolytes for Li-ion batteries” - **member of the project**
6. Polish Ministry of Science and Higher Education Grant No N N205 014134 “Synthesis and properties of new polymer electrolytes for the new generation of high-energy and safe Li-ion batteries” - **member of the project**
7. R&D project POIG. 01.03.01-00-086/09 (in progress), Title: "Advanced manufacturing technologies of functional materials for conducting, processing and storage of energy" Area II Task 3 "Semiconductor materials with skutterudite structure for electrodes in lithium ion cells and thermogenerator producing electricity"- **task leader**
8. Strategic project POIG. 01.01.02-00-015/09 (in progress), Title: "Advanced materials and technologies for their production" Area VI, Task 7, "Nanostructured, conductive composite membranes as solid electrolytes for lithium electrochemical cells and photovoltaic systems" – **task leader**

Major publications

1. M. Weiss, M. Walkowiak, K. Wasiński, P. Pótrolniczak, B. Kokocińska, W. Strupiński, "Comparative Morphological Analysis of Graphene on Copper Substrate Obtained by CVD from a Liquid Precursor", **Acta Physica Polonica A** 131 (2017) 1497-1506.
2. K. Wasiński, P. Nowicki, P. Pótrolniczak, M. Walkowiak, R. Pietrzak, "Processing Organic Waste Towards High Performance Carbon Electrodes for Electrochemical Capacitors", **International Journal of Electrochemical Science** 12 (2017) 128-143.
3. Ł. Majchrzycki, M. Walkowiak, A. Martyła, M.Y. Yablokov, M. Nowicki, R. Czajka, "Graphene oxide-multiwalled carbon nanotubes composite as an anode for lithium ion batteries", **Materials Science Poland** 34 (2016) 481-486.
4. P. Pótrolniczak, P. Nowicki, K. Wasiński, M. Walkowiak, R. Pietrzak "Biomass-derived hierarchical carbon as sulfur cathode stabilizing agent for lithium-sulfur batteries" **Solid State Ionics** 297 (2016) 59-63.
5. S. Suriyakumar, M. Kanagaraj, N. Angulakshmi, M. Kathiresan, K.S. Nahm, M. Walkowiak, K. Wasiński, P. Pótrolniczak, A.M. Stephan „Charge-discharge studies of all-solid-state Li/LiFePO₄ cell with PEO- based composite electrolytes encompassing metal organic frameworks" **RSC Advances** 6 (2016) 97180-97186.
6. P. Pótrolniczak, K. Wasiński, M. Walkowiak, "Humic Acid-Derived Mesoporous Carbon as Cathode Component for Lithium-Sulfur Battery", **International Journal of Electrochemical Science** 10 (2015) 9370-9378.
7. K. Wasiński, M. Walkowiak*, P. Pótrolniczak, G. Lota, "Capacitance of Fe₃O₄/rGO nanocomposites in an aqueous hybrid electrochemical storage device", *Journal of Power Sources* 293 (2015) 42-50.
8. K. Wasiński, M. Walkowiak*, G. Lota, "Humic acids as pseudocapacitive electrolyte additive for electrochemical double layer capacitors", **Journal of Power Sources**, 255 (2014) 230.
9. M. Zalas*, M. Walkowiak*, B. Gierczyk, M. Osińska-Broniarz, P. Pótrolniczak, G. Schroeder, "Novel Si-tripodand functionalized ionic liquids as iodide sources for dye-sensitized solar cells" **Electrochimica Acta**, 108 (2013) 736.
10. Ł. Majchrzycki*, M. Michalska, M. Walkowiak, Z. Wiliński, L. Lipińska, "Graphene oxide-assisted synthesis of LiMn₂O₄ nanopowder", **Polish Journal of Chemical Technology**, 15 (2013) 15.
11. G. Lota, M. Walkowiak*, G. Schroeder, B. Gierczyk, "Electrochemical Behavior of Tripodand-Type Silanes as Electrolyte Solvents for Electrochemical Capacitors", **International Journal of Electrochemical Science** 8 (2013) 9222.
12. M. Zalas*, M. Walkowiak, G. Schroeder, "Increase in efficiency of dye-sensitized solar cells by porous TiO₂ layer modification with gadolinium-containing thin layer", **Journal of Rare Earths**, 29 (2011) 783.
13. M. Walkowiak*, "Siloxane-Impregnated Graphite Anode for Li-Ion Cells With PC-Based Electrolytes", **International Journal of Electrochemical Science**, 6 (2011) 684.
14. Zalewska*, M. Walkowiak, L. Niedzicki, T. Jesionowski, N. Langwald, "Study of the interfacial stability of PVdF/HFP gel electrolytes with sub-micro- and nano-sized surface-modified silicas", **Electrochimica Acta** 55 (2010) 1308.
15. M. Walkowiak*, D. Waszak, G. Schroeder, B. Gierczyk, „ Enhanced graphite passivation in Li-ion battery electrolytes containing disiloxane-type additive/co-solvent", **Journal of Solid State Electrochemistry**, 14 (2010) 2213.
16. M. Walkowiak*, M. Osińska, T. Jesionowski, K. Siwińska-Stefańska, "Synthesis and characterization of a new hybrid TiO₂/SiO₂ filler for lithium conducting gel electrolytes", **Central European Journal of Chemistry**, 8 (2010) 1311.
17. M. Osińska, M. Walkowiak*, A. Zalewska, T. Jesionowski, „Study of the role of ceramic filler in composite gel electrolytes based on microporous polymer membranes", **Journal of Membrane Science** 326 (2009) 582.

18. M. Walkowiak, D. Waszak, G. Schroeder, B. Gierczyk, „Enhanced graphite passivation in Li-ion battery electrolytes containing disiloxane-type additive/co-solvent”, *Journal of Solid State Electrochemistry*, DOI: 10.1007/s10008-008-0710-4.
19. M. Walkowiak*, D. Waszak, B. Gierczyk, G. Schroeder, “Impact of selected supramolecular additives on the initial electrochemical lithium intercalation into graphite in propylene carbonate”, **Central European Journal of Chemistry** 6 (2008) 600.
20. M. Walkowiak*, D. Waszak, G. Schroeder, B. Gierczyk, “Polyether-functionalized disiloxanes as new film-forming electrolyte additive for Li-ion cells with graphitic anodes”, **Electrochemistry Communications** 10 (2008) 1676.
21. M. Hofman*, M. Walkowiak, L. Wachowski, B. Czajka, D. Waszak, „Evaluation of NO-treated fossil carbons as possible anode materials for Li-ion batteries - role of prior activation”, **Materials Research Innovations** 11(1) (2007) 14.
22. M. Walkowiak*, G. Schroeder, B. Gierczyk, D. Waszak, M. Osińska, “New lithium ion conducting polymer electrolytes based on polysiloxane grafted with Si-tripodand centers”, **Electrochemistry Communications** 9 (2007) 1558.
23. M. Walkowiak*, A. Zalewska, T. Jesionowski, M. Pokora, “Stability of poly(vinylidene fluoride-co-hexafluoropropylene) based composite gel electrolytes with functionalized silicas”, **Journal of Power Sources** 173 (2007) 721.
24. J. M. Skowroński, S. Błazewicz, M. Walkowiak, “Preparation and properties of novel carbon/carbon composite anode for lithium-ion cells”, **Journal of New Materials for Electrochemical Systems** 9(4) (2006) 359.
25. G. Schroeder, B. Gierczyk, D. Waszak, M. Walkowiak*, "Impact of ethyl tris-2-methoxyethoxy silane on the passivation of graphite electrode in Li-ion cells with PC-based electrolyte", **Electrochemistry Communications** 8 (2006) 1583
26. G. Schroeder, B. Gierczyk, D. Waszak, M. Kopczyk, M. Walkowiak*, „Vinyl tris-2-methoxyethoxy silane – a new class of film-forming electrolyte components for Li-ion cells with graphite anodes”, **Electrochemistry Communications** 8 (2006) 523.
27. M. Walkowiak*, A. Zalewska, T. Jesionowski, D. Waszak, B. Czajka, “Effect of chemically modified silicas on the properties of hybrid gel electrolyte for Li-ion batteries”, **Journal of Power Sources**, 159 (2006) 449.
28. J.M. Skowroński, M. Walkowiak, “Lithium intercalation into CrO₃-GIC and its derivatives”, **Journal of Solid State Electrochemistry** 8 (2003) 23.

Monographs

1. M. Walkowiak, K. Knofczyński, D. Waszak, M. Kopczyk, M. Rusinek, J. Machnikowski, „Performance of novel types of carbonaceous materials in the anodes of CLAlO's lithium-ion battery systems”; in “New Carbon Based Materials for Electrochemical Energy Storage Systems”, ed. by I.V. Barsukov et al., Springer 2006.
2. M. Walkowiak, D. Waszak, M. Osińska, G. Lota, B. Gierczyk, G. Schroeder, „Zastosowania podandów krzemowych w akumulatorach litowo-jonowych i kondensatorach elektrochemicznych”, Rozdział 8 w „Receptory Supramolekularne”, pod red. G. Schroedera, BETAGRAPH, Poznań 2007.
3. M. Walkowiak, “New concepts in composite polymer-ceramic electrolytes for Li-ion batteries”, Chapter 15 in “Advanced Materials and Methods for Lithium-Ion Batteries”, ed. by S.S. Zhang, Transworld Research Network 2007.
4. M. Walkowiak, “Advances in Li-ion Battery Materials with the Application of Silanes and Other Organosilicon Compounds - Overview of Possible Strategies”, Chapter 8 in “Synthetic Receptors in Molecular Recognition”, ed. by V.I. Rybachenko, Publishing House “Schidnyj Wydawnyczyj Dim”, Doneck 2007.
5. M. Zalas, M. Walkowiak, “Ionic liquids as electrolyte components in quasi solid state photoelectrochemical cells”, in “Molecular receptors”, ed. By V.I. Rybachenko, East Publisher House, Doneck 2011.

Selected international conference communications

(2006 – until now; only communications presented by M. Walkowiak are listed)

1. ISE Spring Meeting, Singapore 2006, "Passive layer formation on surface pre-treated graphite electrode reduced in propylene carbonate solution", authors: Grzegorz Schroeder, Mariusz Walkowiak, Daniel Waszak, Błażej Gierczyk; **oral presentation**
2. 16th International Conference on Solid State Ionics, Shanghai 2007, "Ion transport properties and stability of new siloxane-polyether-type polymer electrolytes", authors: M. Walkowiak, D. Waszak, M. Osińska, B. Gierczyk, G. Schroeder; **oral presentation**
3. 9nd International Conference *Advanced Batteries and Accumulators*, Brno 2008, "Novel functional co-solvents/additives for Li-ion batteries based on silane compounds" , authors: M. Walkowiak, D. Waszak, B. Gierczyk G. Schroeder; **oral presentation**
4. 11th International Conference *Fast Ionic Conductors*, Grybów 2008, "Impact of disiloxane-type additive on the initial lithium intercalation into graphite in PC-based electrolytes", authors: M. Walkowiak, D. Waszak, M. Rusinek, B. Gierczyk, G. Schroeder; **oral presentation**
5. 2nd International Conference *By-product metals in non-ferrous metals industry* , Wrocław 2010, "Global availability of lithium as factor determining the world-wide transformation to electric transformation", author: M. Walkowiak; **oral presentation**
6. *First International Conference on Composites and Nanocomposites (ICNC 2011*, Kottayam, India 2011, „ Novel composite polymer-ceramic membranes for Li-ion batteries with gel electrolytes", author: M. Walkowiak; **INVITED TALK**
7. 13th International Conference *Advanced Batteries, Accumulators and Fuel Cells*, Brno 2012, "Structural and electrochemical properties of composite gel electrolytes with oxide nanofillers" authors: Mariusz Walkowiak, Monika Osińska-Broniarz, Monika Pokora, Paulina Pótrolniczak, Maciej Kopczyk, **oral presentation**
8. International Symposium on Advanced Polymeric Materials 2012, "Polymer membranes with oxide nanofillers for energy conversion and storage applications", author: M. Walkowiak, **oral presentation**

Selected awards and certificates

1. Minister of Science and Higher Education of Poland Fellowship for Outstanding Young Scientists (2007)
2. Chair on Nanoscience and Nanotechnology awarded by International and Inter University Centre for Nanoscience and Nanotechnology, Mahatma Gandhi University, Kottayam, India, 2014
3. Cambridge Certificate of Proficiency in English (No 5580608)

Visiting foreign institutions

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| 2008 | Lawrence Berkeley National Laboratory, Berkeley, USA, (2 months) |
| 2014 | Mahatma Gandhi University, Kottayam, India, 2014 (2 weeks) |