Curriculum Vitae
Professor ChM. Dr. Zulkarnain Zainal FRSC

Date/Place of birth: August 9, 1962 / Semiling, Kedah, Malaysia
Citizenship: Malaysian
Marital Status: Married
Postal address: Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia
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Field of Expertise: Materials Chemistry, Semiconductor Electrochemistry

Academic qualifications

Ph. D (Chemistry), UMIST, UK, 1989
B. Sc (Hons) (Chemistry), Universiti Kebangsaan Malaysia, 1985
Matriculation, Sekolah Alam Shah, Kuala Lumpur, 1981
SPM, Sekolah Menengah Pokok Sena, Kedah, 1979

Career History

Professor, Department of Chemistry UPM (since February 2005)
Assoc. Professor, Department of Chemistry UPM (August 1997 – January 2005)
Lecturer, Department of Chemistry UPM (October 1989 – July 1997)
Tutor, Department of Chemistry UPM (August 1985 – October 1989)

Administration Post

Head of Department of Chemistry, UPM (June 2005 – September 2007, Oct 2017 – Oct 2020)
Deputy Dean, Faculty of Science, UPM (October 2007 – September 2009)
Deputy Dean, School of Graduate Studies UPM (October 2009 – September 2016)

Research Associate

Materials Science and Characterisation Laboratory, Institute of Nanoscience and Nanotechnology (ION2), UPM
Catalysis Science and Technology Research Centre (PUTRACAT), Faculty of Science, UPM

Awards, Medals and Fellowships

National Young Scientist Award 1998
Excellent Service Award 2002, 2010, 2018
5 Gold, 2 Silver & 2 Bronze Medals at Invention and Research Exhibition, Universiti Putra Malaysia. (Project leader)
1 Gold & 1 Bronze Medals at Invention/innovation expo S&T 2002 – 2004 by Ministry of Science Technology and Environment. (Project leader)
7 Gold Medal, 12 Silver & 11 Bronze medals at Invention and Research Exhibition, Universiti Putra Malaysia. (Co-researcher)
1 Gold & 1 Silver Medal, Geneva International Invention and Exhibition. (Co-researcher)

Teaching

Subjects: Electrochemistry, physical and inorganic chemistry, industrial chemistry, introductory chemistry, analytical chemistry, solid state characterization, chemical kinetics, thermodynamics, research method in chemistry

Student Supervision

PhD 21 (17 graduated) as chairman + 58 (46 graduated) as committee member
Master 20 (20 graduated) as chairman + 35 (32 graduated) as committee member
Final Year Project students more than 150

Researchs Areas

Semiconductor Electrodeposition, Photoeletrocatalysis, Supercapacitors, Photoelectrochemical solar cells, Activated Carbon. Lead 15 projects and researcher for more than 20 projects since 1991

Recent Research Projects

1. Chemical and electrochemical synthesis of binary and ternary metal chalcogenides film for solar cell applications (IRPA 2002 – 2005, RM208,000)
2. Preparation and characterisation of cadmium chalcogenides thin films by pulse reversal technique for opto-electronic devices (IRPA 2003 – 2006, RM231,000)
3. Photooxidation of Organic Compounds using oxide semiconductor thin films (Fundamental 2004 – 2006, RM50,000)
4. Preparation of High Efficient OLED from Metal Chalcogenides and Polythiophene Deivatives for Display Applications (Science Fund 2006 – 2008, RM90,000)
5. Development of Oil Palm Carbon-Based Supercapacitors for Energy Storage (Science Fund 2006 – 2009, RM102,000)
6. Mechanistic and structural aspects of metal chalcogenide films prepared by electrochemical methods (FRGS Fund 2006 – 2009, RM78,000)
7. Electrochemical Growth of Ordered Nanotubular Titania for Photoelectrochemical Cells (FRGS Fund 2010 – 2012, RM55,200)
8. Tin based chalcogenides semiconductor nanofilms by pulse potential electrodeposition and their electrochemical and photoelectrochemical characteristics (RUGS 2010 – 2012, RM140,000)
9. Modified nickel cobalt oxide/activated carbon composite for supercapacitors (Science Fund 2012 – 2014, RM234,600)
10. Electrochemical capacitive behaviour of modified nanostructured manganese oxide (ERGS Fund 2013 – 2016, RM140,000)
11. Influence of electrolyte diffusion behaviour on the performance of nanostructured oxide semiconductor prepared by electrochemical techniques (FRGS 2014 – 2016, RM105,000)
12. Role of Dopant in Enhancing Electrochemical Performance of Metal Chalcogenide-Metal Oxide Hybrid Thin Films in Photoelectrochemical Cell (FRGS 2017 – 2020, RM78,000)
13. Electrochemical Double Layer Capacitance of Reduced Titania Nanotubes Modified with Transition Metal Oxides (GPB UPM 2017 – 2020, RM149,400)

14. Ordered Mesoporous Carbon Thin Films from Bamboo and MnO2 Nanocomposites Modified from Carbon Synthetic Precursor for Supercapacitor Electrode Material (GP IPS UPM 2017 – 2020, RM20,000)
15. Tailoring surface and electronic properties of metal oxide nanostructured for improvement of photoconversion performance Geran Putra Berimpak (GP-GPB) (2021 – 2024, RM120,200)

Publications

>300 Papers in citation index and refereed journals
>200 Conferences/Seminars proceedings/abstracts (international + national)
4 Patents Granted
3 Module Chapters
42 H-index, 7506 citations

Selected Publication in Journals

1. Holi, A.M., Zainal, Z., Al-Zahrani, A.A., Ayal, A.K., Najm, A.S., Effect of Varying AgNO3 and CS(NH2)2 Concentrations on Performance of Ag2 S/ZnO NRs/ITO Photoanode, Energies, 2022, 15(8), 2950
2. Muzakir M.M., Zainal Z., Lim H.N., Abdullah A.H., Bahrudin N.N., Enhanced capacitive performance of cathodically reduced titania nanotubes pulsed deposited with Mn2O3as supercapacitor electrode, 2021, RSC Advances, 11, 43, 26700-26709 Q2
3. Ali M.S.M., Zainal Z., Hussein M.Z., Wahid M.H., Bahrudin N.N., Muzakir M.M., Jalil R., Porous carboxymethyl cellulose carbon of lignocellulosic based materials incorporated manganese oxide for supercapacitor application, 2021, International Journal of Biological Macromolecules, 180, 654-666 Q1 (10%)
4. Ayal A.K., Zainal Z., Holi A.M., Lim H.-N., Talib Z.A., Lim Y.-C., Sensitization of TiO2 nanotube arrays photoelectrode via homogeneous distribution of CdSe nanoparticles by electrodeposition techniques, 2021, Journal of Physics and Chemistry of Solids, 153, 110006 Q2
5. Tan H.J., Zainal Z., Talib Z.A., Lim H.N., Shafie S., Tan S.T., Tan K.B., Bahrudin N.N., Synthesis of high quality hydrothermally grown ZnO nanorods for photoelectrochemical cell electrode, 2021, Ceramics International, 47, 10, 14194-14207 Q1 (10%)
6. Sarif M., Zainal Z., Hussein M.Z., Wahid M.H., Bahrudin N.N., Enhanced Capacitive Performance of Manganese Oxide/Mesoporous Carbon Composite Film Electrodes, 2021, Journal of Electronic Materials, 50, 2, 419-431 Q3
7. Bahrudin N.N., Nawi M.A., Zainal Z., Insight into the synergistic photocatalytic-adsorptive removal of methyl orange dye using TiO2/chitosan based photocatalyst, 2020, International Journal of Biological Macromolecules, 165, 2462, 2474
8. Al-Zahrani A.A., Zainal Z., Talib Z.A., Lim H.N., Holi A.M., Bahrudin N.N., Enhanced photoelectrochemical performance of Bi2S3/Ag2S/ZnO novel ternary heterostructure nanorods, 2020, Arabian Journal of Chemistry, 13, 12, 9166, 9178
9. Bahrudin N.N., Nawi M.A., Zainal Z., Schneider R., Sabar S., Enhanced decolourization of methyl orange by immobilized TiO2/chitosan-montmorillonite, 2020, Water Science and Technology, 82, 3, 454, 467
10. Muzakir M.M., Zainal Z., Lim H.N., Abdullah A.H., Bahrudin N.N., Ali M.S., Electrochemically reduced titania nanotube synthesized from glycerol-based electrolyte as supercapacitor electrode, 2020, Energies, 13, 11, 2767
11. AL-Zahrani, A.A., Zainal, Z., Talib, Z.A., Lim, H.N., Holi, A.M., Bismuth sulphide decorated ZnO nanorods heterostructure assembly via controlled SILAR cationic concentration for enhanced photoelectrochemical cells (2020) Materials Research Express, 7 (2), art. no. 025510.
12. Sarif, M., Zainal, Z., Hussein, M.Z., Wahid, M.H., Bahrudin, N.N., Controlled concentration of mn salt for the synthesis of manganese oxide/mesoporous carbon film as potential electrodes for supercapacitor (2020) Malaysian Journal of Analytical Sciences, 24 (2), pp. 209-217.

13. Al-Zahrani, A.A., Zainal, Z., Talib, Z.A., Lim, H.N., Fudzi, L.M., Holi, A.M., Sarif, M., Effect of annealing temperature on the performance of ZnO seed layer for photoanode in photoelectrochemical cells (2020) Defect and Diffusion Forum, 398 DDF, pp. 156-166.
14. Holi, A.M., Zainal, Z., Ayal, A.K., Chang, S.-K., Lim, H.N., Talib, Z.A., Yap, C.-C., Ag2S/ZnO Nanorods Composite Photoelectrode Prepared by Hydrothermal Method: Influence of Growth Temperature (2019) Optik, 184, pp. 473-479.
15. Al-Zahrani, A.A., Zainal, Z., Talib, Z.A., Lim, H.N., Mohd Fudzi, L., Holi, A.M., Sarif-Mohd Ali, M., Synthesis of Binary Bi2S3/ZnO Nanorod Array Heterostructure and Their Photoelectrochemical Performance (2019) Journal of Nanomaterials, 2019, art. no. 5212938.
16. Sarif, M., Ali, M., Zainal, Z., Hussein, M.Z., Wahid, M.H., Chang, S.-K., Fudzi, L.M., Meed Al-Zahrani, A.A., Mesoporous carbon film via spin coating soft templating method for supercapacitor electrode (2019) International Journal of Nanotechnology, 16 (11-12), pp. 640-659.
17. Holi, A.M., Zainal, Z., Ayal, A.K., Chang, S.-K., Lim, H.N., Talib, Z.A., Yap, C.-C. Effect of heat treatment on photoelectrochemical performance of hydrothermally synthesised Ag2S/ZnO nanorods arrays (2018) Chemical Physics Letters, 710, pp. 100-107.
18. Ayal, A.K., Zainal, Z., Lim, H.N., Talib, Z.A., Lim, Y.-C., Chang, S.-K., Holi, A.M. Fabrication of CdSe nanoparticles sensitized TiO2 nanotube arrays via pulse electrodeposition for photoelectrochemical application(2018) Materials Research Bulletin, 106, pp. 257-262.
19. Chua, C.W., Zainal, Z., Lim, H.N., Chang, S.-K. Effect of electrolytes on the electrochemical performance of nickel cobaltite–titania nanotubes composites as supercapacitive materials(2018) Journal of Materials Science: Materials in Electronics, 29 (17), pp. 14445-14454.
20. Fudzi, L.M., Zainal, Z., Lim, H.N., Chang, S.-K., Holi, A.M., Ali, M.S.-M. Effect of temperature and growth time on vertically aligned ZnO nanorods by simplified hydrothermal technique for photoelectrochemical cells(2018) Materials, 11 (5), art. no. 704.
21. Samsudin, N.A., Zainal, Z., Lim, H.N., Sulaiman, Y., Chang, S.-K., Lim, Y.-C., Ayal, A.K., Mohd Amin, W.N. Capacitive performance of vertically aligned reduced titania nanotubes coated with Mn2O3 by reverse pulse electrodeposition(2018) RSC Advances, 8 (41), pp. 23040-23047.
22. Zuru, D. U., Z. Zainal, M. Z. Hussein, A. M. Jaafar, H. N. Lim and S. K. Chang, Theoretical and experimental models for the synthesis of single- walled carbon nanotubes and their electrochemical properties, Journal of Applied Electrochemistry (2018) 48:287–304
23. Samsudin, N. A., Z. Zainal, Lim H. N., Sulaiman, Y, Chang S. K., Lim Y. C., Mohd Amin, W. N., Enhancment of Capacitive Performance in Titania Nanotubes Modified by Electrochemical Reduction Method, Journal of Nanomaterials, Article ID 9509126 (9 Pages).
24. Ayal, A.K., Zainal, Z., Lim, H.-N., Talib, Z.A., Lim, Y.-C., Chang, S.-K., Holi, A.M. Photocurrent enhancement of heat treated CdSe-sensitized titania nanotube photoelectrode (2017) Optical and Quantum Electronics, 49 (4), art. no. 164, .
25. Holi, A.M., Zainal, Z., Talib, Z.A., Lim, H.-N., Yap, C.-C., Chang, S.-K., Ayal, A.K. Enhanced photoelectrochemical performance of ZnO nanorod arrays decorated with CdS shell and Ag2S quantum dots (2017) Superlattices and Microstructures, 103, pp. 295-303.
26. Holi, A.M., Zainal, Z., Talib, Z.A., Lim, H.-N., Yap, C.-C., Chang, S.-K., Ayal, A.K. Effect of hydrothermal growth time on ZnO nanorod arrays photoelectrode performance(2016) Optik, 127 (23), pp. 11111-11118.
27. Holi, A.M., Zainal, Z., Talib, Z.A., Lim, H.-N., Yap, C.-C., Chang, S.-K., Ayal, A.K. Hydrothermal deposition of CdS on vertically aligned ZnO nanorods for photoelectrochemical solar cell application(2016) Journal of Materials Science: Materials in Electronics, 27 (7), pp. 7353-7360.
28. Abdullah, N.H., Zainal, Z., Silong, S., Tahir, M.I.M., Tan, K.-B., Chang, S.-K. Thermal decomposition synthesis of nanorods bismuth sulphide from bismuth N-ethyl cyclohexyl dithiocarbamate complex(2016) Thermochimica Acta, 632, pp. 37-45.
29. Ayal, A.K., Zainal, Z., Lim, H.-N., Talib, Z.A., Lim, Y.-C., Chang, S.-K., Samsudin, N.A., Holi, A.M., Amin, W.N.M. Electrochemical deposition of CdSe-sensitized TiO2 nanotube arrays with enhanced photoelectrochemical performance for solar cell application(2016) Journal of Materials Science: Materials in Electronics, 27 (5), pp. 5204-5210.
30. Chin, L.Y., Zainal, Z., Hussein, M.Z., Tee, T.W. Investigation on optical and photoelectrochemical properties of self-assembled titania nanotube arrays prepared by anodization [Penyiasatan sifat optik dan fotoelektrokimia swahimpunan nanotiub titania bertatasusunan yang disediakan melalui penganodan](2016) Malaysian Journal of Analytical Sciences, 20 (1), pp. 121-130.
31. Chin, L.Y., Zainal, Z., Khusaimi, Z., Ismail, S.S. Electrochemical synthesis of ordered titania nanotubes in mixture of ethylene glycol and glycerol electrolyte [Sintesis nanotiub titania bertertib secara elektrokimia dalam campuran elektrolit etilena glikol dan gliserol](2016) Malaysian Journal of Analytical Sciences, 20 (2), pp. 373-381.