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ACADEMIC QUALIFICATIONS

- B.Sc. (1987) College of Science - Physics department, The University of Mosul – IRAQ

- M.Sc. (1998) College of Education - Physics department, Baghdad University – IRAQ

M.Sc. project: The Study of the optical and electrical properties of vanadium penta-oxide thin films prepared by thermal evaporation

- Ph.D. (2011) School of Physics, Universiti Sains Malaysia, (USM)

Ph.D project: A Study on the fabrication and characterization of sputtered Cr doped ZnO thin film gas sensors.

- Post Doctoral fellow (Sept. 2012- Sept. 2014), microelectronics and semiconductor packaging, institute of microengineering and nanoelectronics (IMEN), Universiti Kebangsaan Malaysia.
- Post Doctoral fellow (Oct. 2014- jul. 2016), School of Physics, Faculty of science and Technology, Universiti Kebangsaan Malaysia.

AWARDS

1. USM Fellowship 2007 – 2010.
2. Malaysian Sanggar Sanjung award (Publication Category) from University of Science Malaysia /2010.
3. Malaysian Sanggar Sanjung merit reward (Publication Category) from University of Science Malaysia /2010.

4. Malaysian Sanggar Sanjung merit reward (Publication Category) from University of Science Malaysia /2011.

CAREER MILESTONES

- 1988 – 1995 Human Resources Training and Development Institute, Baghdad, Iraq.
- 1998-2003, Thin films technology laboratory - Research Department Al-Milad General Corporation. Baghdad – IRAQ
- 2003-2006 Head of Thin Film Department, Material Science center, Ministry of Science & Technology - IRAQ.
- 2004-2011 Research fellow at the Materials research directorate, Ministry of Science & Technology Baghdad – Iraq.

SCIENTIFIC PROFICIENCY

I have a good experience in the fallowing branches of thin films preparation and characterization units.

1- Electron Beam Vacuum Coating Unit.
2- DC Sputtering System A306 Edwards.
3- RF Magnetron Sputtering System A500 Edwards.

Characterization know how in the fields of

- X-Ray Diffraction (XRD)
- Fourier Transform Infra-Red Spectroscopy (FTIR)
- X-ray photoelectron spectroscopy (XPS)
- UV – Vis Spectroscopy
- Scanning Electron Microscopy and Energy Dispersive Analysis of X-ray (EDAX)
- Atomic Force Microscopy
- Impedance spectroscopy
- Source Measurement units such as SMU Kiethely 237 and 2400 (Keithley Instruments, Inc. USA.)

IT SKILLS

- Windows operating system
- Microsoft Office applications
- Sigma plot and Origin graphing software
- Lab VIEW software for instrument – PC communication (National Instruments Corporation, USA).

FIELDS OF CURRENT RESEARCH INTEREST

- Thin film processing and their characterizations.
- Metal oxide Nanostructures synthesis, characterizations and applications.

TEACHING EXPERIENCE;

- 1988 – 1993 Lab demonstrator of the Nuclear Electronic lab for diploma student at the Human Resources Training and Development Institute, Baghdad, Iraq.

- 1991 – 1994 supervisor of the nuclear measurements lab for the undergraduate student in the nuclear engineering course at the Human Resources Training and Development Institute, Baghdad, Iraq.

- 2007 - 2010 Tutor for different subjects at the School of physics – USM for undergraduate student.

- 2007- 2010 Lab demonstrator: 1st year lab and 3 rd year lab photonic lab.

PROFESSIONAL ACTIVITIES

Reviewer for

1. Fibers and Polymers - Springer.
2. Materials Science and Engineering: B - Elsevier.
3. Sensors Letters, American Scientific Publishers.
4. Journal of Electronic Materials – Springer.
5. Measurement – Elsevier.
6. Phase Transitions - Taylor & Francis
7. Journal of Alloys and Compounds - Elsevier.
8. Physica E - Elsevier.
9. Materials Science in Semiconductor Processing - Elsevier.
10. Small Wiley-VCH Verlag GmbH & Co. KGaA.
11. International Journal of Hydrogen Energy - Elsevier.
12. Materials Chemistry and Physics - Elsevier.
13. IEEE Photonics Technology Letters - IEEE.
14. ChemPhysChem - Wiley-VCH Verlag GmbH & Co. KGaA.
15. Photonics and Nanostructures - Fundamentals and Applications - Elsevier.
16. Physica Status Solidi A: Applications and Materials Science, Wiley-VCH Verlag GmbH & Co. KGaA.
17. NANO, World Scientific Publishing Co Pte Ltd.
18. Analytica Chimica Acta- Elsevier.

REFEREES

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LIST OF PUBLICATIONS
RESEARCH ARTICLES (INDEXED AT ISI AND SCOPUS)
JOURNALS;

1. HIBA S. RASHEED, NASER M. AHMED, M.Z. MATJAFRI, NAIF H. AL-HARDAN, MUNIRAH ABDULLAH ALMESSIERE, FAYROZ A. SABAH, and NABEEL Z. AL-HAZEEM, “Multilayer ZnO/Pd/ZnO Structure as Sensing Membrane for Extended-Gate Field-Effect Transistor (EGFET) with High pH Sensitivity”, Journal of ELECTRONIC MATERIALS (2017) DOI: 10.1007/s11664-017-5580-z.

2. FAYROZ A. SABAH, NASER M. AHMED, MUNIRAH ABDULLAH ALMESSIERE, Z. HASSAN and Naif H. Al-Hardan, “Sensitivity of CuS Membrane pH Sensor With and Without MOSFET”, JOM (2016), DOI: 10.1007/s11837-016-2165-x.

3. N. M. Abd-Alghafour, Naser M. Ahmed, Z. Hassan, Munirah Abdullah Almessiere, M. Bououdina, Naif H. Al-Hardan, “High sensitivity extended gate effect transistor based on V_2O_5 nanorods”, J Mater Sci: Mater Electron. (2016) DOI 10.1007/s10854-016-5669-9.

4. Fayroz A. Sabah, Naser M. Ahmed, Z. Hassan, Naif Al-Hardan, “Sensitivity of CuS and CuS/ITO EGFETs implemented as pH sensors” Appl. Phys. A 122 (2016)839-845.

5. Naif H. Al-Hardan, Muhammad Azmi Abdul Hamid, Roslinda Shamsudin, Norinsan Kamil Othman, Lim Kar Keng, “Amperometric Non-Enzymatic Hydrogen Peroxide Sensor Based on Aligned Zinc Oxide Nanorods”, Sensors 16(2016)1004.

6. Naif Al-Hardan, M.A. Abdul Hamid, Naser M. Ahmed, Azman Jalar, R. Shamsudin, N.K. Othman, Lim Kar Keng, W. S Chiu, Hamzah N. Al-Rawi, “High Sensitive pH Sensor based on Porous Silicon (PSi) Extended Gate Field Effect Transistor”, Sensors 16(2016) 839.

7. Sabah M. Mohammad, Z. Hassan, Rawnaq A. Al-Yahya, Naser M. Ahmed, Mohammed A. Al-Azawi, Nabeel M. Abd-Alghafour, C. W. Chin, N. H. Al-Hardan, “Fabrication of a Highly Flexible Low-Cost H_2 Gas Sensor Using ZnO nanorods Grown on an Ultra-Thin Nylon Substrate”, Journal of Materials Science: Materials in Electronics 27 (9)9461-9469.

8. Karkeng Lim, Muhammad Azmi Abdul Hamid, Roslinda Shamsudin, N.H. Al-Hardan, Ishak Mansor, Weesiong Chiu, “Temperature-driven Structural and Morphological Evolution of Zinc Oxide Nano-coalesced Microstructures and Its Defect-related Photoluminescence Properties”, Materials 9(2016) 300-315.

9. N. H. Al-Hardan, M.A. Abdul Hamid, Naser M. Ahmed, R. Shamsudin, N. K. Othman, “Ag/ZnO/p-Si/Ag Heterojunction and their Optoelectronic Characteristics under Different UV Wavelength Illumination”. Sensors and Actuators A 242 (2016) 50–57.

10. N. H. Al-Hardan, Abdul Hamid, M. A, Naser M. Ahmed, A. Jalar, R. Shamsudin, N.K. Othman, Lim Kar Keng and Sabah M. Mohammad, “A Study on the Ultraviolet (UV) Photo-Response of Hydrothermally-Grown Zinc Oxide (ZnO) Nanorods with Different Aspect Ratios” IEEE Sensors Journal 16(2015) 6811-6818.

11. Sabah M. Mohammad, Z. Hassan, Naser M. Ahmed, N. H. Al-Hardan, M. Bououdina, “Fabrication of low cost UV photo detector using ZnO nanorods grown onto nylon substrate” J Mater Sci: Mater Electron 26(2015)1322–1331.

12. Al-Hardan, N.H., Jalar, A., Abdul Hamid, M.A., Keng, L.K., Shamsudin, R, B. Y. Majlis, “The room-temperature sensing performance of ZnO nanorods for 2-methoxyethanol solvent”, Sensors and Actuators B: Chemical, 203 (2014) 223–228.

13. Al-Hardan, N.H., Jalar, A., Abdul Hamid, M.A., Keng, L.K., Ahmed, N.M., Shamsudin, R., “A wide-band UV photodiode based on n-ZnO/p-Si heterojunctions” Sensors and Actuators, A: Physical, 207(2014)61-66.

14. Al-Hardan, N.H., Jalar, A., Abdul Hamid, M.A., Karkeng, L., Shamsudin, R., “Structural and optical properties of a bi-structured ZnO film prepared via electrodeposition” International Journal of Electrochemical Science, 8(20136767-6774.

15. Lim, K., Abdul Hamid, M.A., Shamsudin, R., Jalar, A., Al-Hardan, N.H., “Synthesis and characterization of grape-like SnO2 structures grown by a

thermal evaporation method" Materials Science Forum, 756(2013)48-53.

16. Al-Salman, H.S., Abdullah, M.J., Al-Hardan, N., "ZnO thin film nanostructures for hydrogen gas sensing applications" Ceramics International 39(2013)S447-S450.

17. Al-Hardan, N.H., Abdullah, M.J., Aziz, A.A.," Performance of Cr-doped ZnO for acetone sensing" Applied Surface Science, 270(2013)480-485.

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20. Johan Ooi, M.D., Abdul Aziz, A., Abdullah, M.J., Al-Hardan, N.H. "The complex impedance behavior of ZnO particles synthesized via fast crystallization precipitation techniques", Digest Journal of Nanomaterials and Biostructures, 7(2012)1179-1187.

21. Al-Hardan, N.H., Abdullah, M.J., Ahmed, N.M., Yam, F.K., Abdul Aziz, A. "UV photodetector behavior of 2D ZnO plates prepared by electrochemical deposition", Superlattices and Microstructures, 51(2012)765-771.

22. L.Y. Low, Mat Johar Abdullah, N.H. Al-Hardan, "A Study of the Structural and Electrical Characteristics of Thermally Oxidized Al-Doped Zn3N2 Film on Glass", Advanced Materials Research 545(2012)294-299.

23. Chuah, L.S., Hassan, Z., Bakhori, S.K.M., Al-Hardan, N.H., Abdullah, M.J. "Optical analysis of nanocrystalline ZnO films coated on porous silicon by radio frequency (RF) magnetron sputtering", Composite Interfaces, 18(2011)441-448.

24. Al-Hardan, N., Abdullah, M.J., Aziz, A.A., "Impedance spectroscopy of undoped and Cr-doped ZnO gas sensors under different oxygen concentrations", Applied Surface Science, 257(2011)8993-8997.

25. Lee, S.C., Ng, S.S., Ooi, P.K., Abu Hassan, H., Hassan, Z., Al-Hardan, N.H., Abdullah, M.J., Yakovlev, V.A., Novikova, N.N. "Surface and interface phonon polariton characteristics of wurtzite ZnO/GaN heterostructure", Applied Physics Letters, 98(2011)241909.

26. Lee, S.C., Ng, S.S., Al-Hardan, N.H., Abdullah, M.J., Hassan, Z., Hassan, H.A., "Studies of surface and interface phonon polariton characteristics of wurtzite ZnO thin film on wurtzite 6H-SiC substrate by p-polarized infrared attenuated total reflection spectroscopy", Thin Solid Films,

519(2011)3703-3708.

27. Al-Hardan, N.H., Abdullah, M.J., Ahmad, H., Aziz, A.A., Low, L.Y. "Investigation on UV photodetector behavior of RF-sputtered ZnO by impedance spectroscopy", Solid-State Electronics, 55(2011)59-63.

28. Al-Hardan, N., Abdullah, M.J., Abdul Aziz, A., Ahmad, H., "ZnO gas sensor for testing vinegar acid concentrations", Sains Malaysiana, 40(2011)67-70.

29. Al-Hardan, N.H., Abdullah, M.J., Abdul Aziz, A., "Electron transport mechanism of thermally oxidized ZnO gas sensors", Physica B: Condensed Matter, 405(2010)4509-4512.

30. Abdulgafour, H.I., Hassan, Z., Al-Hardan, N.H., Yam, F.K., "Growth of high - quality ZnO nanowires without a catalyst", Physica B: Condensed Matter, 405(2010)4216-4218.

31. Al-Hardan, N.H., Abdullah, M.J., Abdul Aziz, A., "Effect of low H_2 concentrations on the current-voltage characteristic of ZnO gas sensor", Advances in Applied Ceramics, 109(2010)436-439.

32. Al-Hardan, N.H., Abdullah, M.J., Abdul Aziz, A., Hassan, Z., "The effect of heat treatments on the properties of Ti/Pt heating elements for gas sensor applications", Materials Science in Semiconductor Processing, 13(2010)199-204.

33. Al-Hardan, N.H., Abdullah, M.J., Abdul Aziz, A., Ahmad, H., Low, L.Y., "ZnO thin films for VOC sensing applications", Vacuum, 85(2010)101-106.

34. Abdulgafour, H.I., Hassan, Z., N. H. Al-Hardan, Yam, F.K.,"Growth of zinc oxide nanoflowers by thermal evaporation method", Physica B: Condensed Matter, 405(2010)2570-2572.

35. Al-Hardan, N.H., Abdullah, M.J., Aziz, A.A., "Sensing mechanism of hydrogen gas sensor based on RF-sputtered ZnO thin films", International Journal of Hydrogen Energy, 35(2010)4428-4434.

36. Al-Hardan, N., Abdullah, M.J., Abdul Aziz, A., Ahmad, H., "Low operating temperature of oxygen gas sensor based on undoped and Cr-doped ZnO films", Applied Surface Science, 2562010)3468-3471.

37. Al-Hardan, N.H., Abdullah, M.J., Abdul Aziz, A., Ahmad, H., Rashid, M. "The effect of oxygen ratio on the crystallography and optical emission properties of reactive RF sputtered ZnO films", Physica B: Condensed Matter, 405(2010)1081-1085.

38. Al-Hardan, N., Abdullah, M.J., Aziz, A.A., "The gas response enhancement from ZnO film for H_2 gas detection", Applied Surface Science, 255(2009)7794-7797.

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1) Naif Al-Hardan, A. Abdul Hamid, Roslinda Shamsudin and Norinsan Kamil Othman, "Ultraviolet Sensors Based on Two Dimensional Zinc Oxide Structures" in OPTOELECTRONICS, Edit by Sergei Pyshkin & John Ballatom, 2017 InTech, Rijeka, Croatia. ISBN 978-953-51-5219-4.

2) N. H. Al-Hardan, M.J. Abdullah and A. Abdul Aziz, "ZnO GAS SENSOR - FUNCTIONALITY AND PERFORMANCE" in Gas Sensors: Developments, Efficacy and Safety, Edit by Xiaotun Qiu, 2011 Nova Science Publishers, Inc. USA. ISBN 978-1-61470-829-2.

3) N. H. Al-Hardan, M.J. Abdullah and A. Abdul Aziz, "The Fabrication And Characterization Of ZnO Gas Sensors", 2011 LAP LAMBERT Academic Publishing GmbH & Co. KG, ISBN: 978-3-8454-7032-0.

CONFERENCE PROCEEDINGS

1. N.H. Al-Hardan, M.S. Al-Robaee and A.H. Al-Musawi, "The effect of substrate temperature and post deposition annealing on the optical absorption of V_2O_5 thin films". 3rd Jordanian mechanical and Industrial Engineering Conference JMIEC 9-12 May 1999, page 247. Amman – Jordan.

2. N.H. Al-Hardan and A.H. Al-Musawi "The effect of substrate temperature on the structure and IR transmittance of thermal evaporated V_2O_5 thin films". Conference of physics and material science 24-26 Apr. 1999. Baghdad – IRAQ.

3. A.H. Al-Musawi and N.H. Al-Hardan "The optical constant of V_2O_5 thin films as a function of substrate temperature", International conference on energy system. Sept. 25-30(2000), page359 Amman - Jordan.

4. N.H. Al-Hardan and A.H. Al-Musawi, The effect of substrate temperature on the electrical conductivity of V_2O_5 thin films prepared by thermal evaporation, Sharjah Solar Energy conference. Sharjah-UAE. 19-22 February 2001

5. Haslinda Abdul Hamid, Mat Johar Abdullah, Azlan Abdul Aziz, Naif H. AL – Hardan, Siti Azlina Rosli, "Effect of N_2 and O_2 Anneal Gas Ratio For Low Resistance p – Type ZnO Formation", 2006 IEEE International Conference on Semiconductor Electronics (ICSE 2006)", Kuala Lumpur, Malaysia 29 Nov. – 1 Dec. 2006.

6. N. H. Al-Hardan, M.J. Abdullah, A. Abdul Aziz, H. Abdul Hamid, " Electrical Properties of ZnO Films Prepared by The Oxidation of Zn", International Conference on Advancement of Materials and Nanotechnology (ICAMN-2007), Langkawi, Kedah, Malaysia, 29 May - 1 June 2007.

7. N. H. Al-Hardan, M.J. Abdullah, A. Abdul Aziz, H. Abdul Hamid, "The Effect of The Oxidation Time on The Optical and Structural Properties of ZnO Thin Film.",

International Conference on Advancement of Materials and Nanotechnology (ICAMN-2007), Langkawi, Kedah, Malaysia, 29 May - 1 June 2007. AIP Conference Proceedings 1217, pp341.

8. H. A. Hamid, M. J. Abdullah, A. A. Aziz, and N. H. Al-Hardan, A Study on the Structural Change of Al–N Co-Doped ZnO Thin Films, International Conference on Advancement of Materials and Nanotechnology (ICAMN-2007), Langkawi, Kedah, Malaysia, 29 May - 1 June 2007. AIP Conference Proceedings 1217, pp166.

9. N. H. Al-Hardan, M.J. Abdullah, A. Abdul Aziz and Z. Hassan, "Electrical and Microstructure Properties of Ti/Pt for Semiconductor Gas Sensors Heating Elements Applications", IEEE Regional Symposium on Microelectronics, 3 - 6 December 2007 Penang, Malaysia.

10. N. H. Al-Hardan, M.J. Abdullah, A. Abdul Aziz, Gas sensing properties of ZnO thin films, IEEE Regional Symposium on Microelectronics, 3 - 6 December 2007 Penang, Malaysia

11. N. H. Al-Hardan, M. J. Abdullah, A. Abdul Aziz, "Electron Transport Mechanism of Thermally Oxidized ZnO Gas Sensors", NATIONAL PHYSICS CONFERENCE (PERFIK2007) 2007- Terengganu, Malaysia.

12. N. Al-Hardan, M.J. Abdullah, A. Abdul Aziz and H. Ahmad, "ZnO gas sensor for testing vinegar acid concentrations", NATIONAL PHYSICS CONFERENCE 2009 (PERFIK2009) - Avillion Legacy Hotel, Malacca, Malaysia 7-9 December 2009.

13. H.I. Abdulgafour, Z. Hassan, F. K. Yam and N. Al-Hardan, Well-aligned Zinc oxide nanoflowers prepared without catalyst, NATIONAL PHYSICS CONFERENCE 2009 (PERFIK2009) - Avillion Legacy Hotel, Malacca, Malaysia 7-9 December 2009.

14. H. Ahmad, M. J. Abdullah and N. H. Al-Hardan, "The effect of substrate temperature on structural, optical and electrical properties of ZnO film." - NATIONAL PHYSICS CONFERENCE 2009 (PERFIK2009) - Avillion Legacy Hotel, Malacca, Malaysia 7-9 December 2009.

15. H. Ahmad, M. J. Abdullah and N. H. Al-Hardan, "The UV Photodetector of ZnO Film", NATIONAL PHYSICS CONFERENCE 2009 (PERFIK2009) - Avillion Legacy Hotel, Malacca, Malaysia 7-9 December 2009.

16. W. L. Chen, S. C. Lee, S. S. Ng, H. Ahmad, N. H. Al-Hardan, M. J. Abdullah, Z. Hassan, H. abu Hassan, "Effects of film thickness on the surface phonon polariton mode of wurtzite ZnO semiconductor". 18th International Vacuum Congress IVC-18-Beijing, China, August 23-27 2010.

17. C. G. Ching, P. K. Ooi, S. S. Ng, Z. Hassan, H. Abu Hassan, N. H. Al-Hardan, and M. J. Abdullah, “Structural Properties Studies of Zinc Oxide Thin Film Grown on Silicon Carbide by Means of X-Ray Diffraction Technique”. AIP Conf. Proc. 1328 (2011)261-263.

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20. Lim, K., Hamid, M.A.A., Shamsudin, R., Jalar, A., Al-Hardan, N.H., “Structural, morphological and photoluminescence studies of SnO_2 microparticles” (2012) 2012 10th IEEE International Conference on Semiconductor Electronics, ICSE 2012 - Proceedings, art. no. 6417247, pp. 733-735.