

KHALID M. ALZOUBI, PH.D.

Assistant Professor, Industrial Engineering



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EDUCATION

- *Ph.D., Industrial and Systems Engineering, State University of New York at Binghamton, Binghamton, NY, USA, 2010.*
- *M.S., Mechanical Engineering, Jordan University of Science and Technology, JORDAN, 2005.*
- *B.S., Mechanical Engineering, "Mechatronics" Jordan University of Science and Technology, JORDAN, 2002.*

Employment

(Sep '18- present) Assistant Professor, Department of Industrial Engineering, Jordan University of Science and Technology, Irbid, Jordan.

Courses taught

- *Quality Control (IE 443)*
- *Supply Chain Management (IE 541)*
- *Engineering Measurements Lab (IE 335)*
- *Reliability and Maintenance Management (IE 560)*

(Aug '14- Jun '18) Assistant Professor, Department of Industrial Engineering, Yarmouk University, Irbid, Jordan.

Courses taught

- *Project Management and Quality Control (EPE 310)*
- *Engineering Workshops (IE 205)*
- *Metrology (IE 212)*
- *Metrology Lab (IE 213)*
- *Work Measurement and Analysis (IE 318)*
- *Entrepreneurship and Small Business Management (IE 542)*
- *Applied Engineering Statistics (IE 347)*

(Aug '12- Aug '14) Assistant Professor, Department of Engineering Management, Prince Sultan University, Riyadh, Saudi Arabia.

Courses taught

- *Project Management (EM 326)*
- *Quality Management (EM 347)*
- *Statics (EM 203)*
- *Thermodynamics (EM 205)*
- *Fluid Mechanics (EM 207)*

(Jan '09- May '09) Co-Teacher, Department of Systems Science and Industrial Engineering at State University of New York at Binghamton, Binghamton, USA.

- *Taught Design of Experiments for senior Industrial Engineering students at State University of New York at Binghamton.*

**(Oct '11- Feb '12) Quality and Reliability Statistician, Amonix Inc. -Solar Modules Manufacturing Company-
, Seal Beach, California.**

- Defined and developed experiments for product engineering, process management, yield, BOM, and supply chain optimization.
- Implemented reliability models, test strategies, quality assurance methods for yield enhancement.
- Used DoE, FMEA, failure and statistical data analysis to improve product and system reliability.
- Defined and implemented reliability models for (CPV) systems through design and decision making across multiple programs.
- Collected process data using statistical control methods to produce various charts, diagrams and graph to optimize manufacturing efficiency and improve quality using predictive models, trend analysis, and DoE.
- Developed process control methods (AQL), evaluated experimental results and provided conclusions, determined operator error and process variation.
- Developed process flow diagrams, FMECA, risk management, procurement requirements, quality control appraisal methods and standards for (CPV) systems.
- Investigated specific customer complaints or operational problems to identify root cause and effective corrective and preventive actions (CAPA).

(Feb '11- Oct '11) Postdoctoral Research Associate, Center of Autonomous Solar Power (CASP), State University of New York at Binghamton, Binghamton, NY.

- Studied the reliability of thin-film solar cells, characterized failures, and implemented reliability models to predict life.
- Developed decisions on the suitability of materials and processes in thin-film photovoltaic solar cell reliability and performance.
- Designed and analyzed experiments to study the behavior of very thin films deposited on flexible substrates under high cycle bending fatigue for flexible solar cell applications.
- Conducted statistical analysis for failure data and studied the effect of mechanical and environmental stressors on the bending fatigue of thin films on flexible substrates.

(Aug '07- Dec '10) Graduate Research Associate, Integrated Electronics Engineering Center (IEEC), State University of New York at Binghamton, Binghamton, NY.

- Studied the reliability of copper pillars in electronic packages, analyzed the failure modes and built finite element models to study the high stresses resulted from mechanical and thermal loadings.
- Conducted an FMEA to study the factors affecting the fatigue life of copper pillars.
- Conducted comparison and optimization studies between photolithography and inkjet printing of polymeric thin films on flexible substrates.

(Jan '07- Dec '10) Graduate Research Associate, Center of Advanced Microelectronics Manufacturing (CAMM), State University of New York at Binghamton, Binghamton, NY.

- Developed, conducted experiments and characterized failures on sputter deposited copper thin films and inkjet-printed silver on PET substrate under high cycle bending.
- Performed statistical analysis using DoE tools to study the effects of temperature, humidity, bending diameter, film thickness, film material, and bending frequency on the high cycle bending fatigue.
- Conducted FMEA studies and analysis of failures in thin films on flexible substrates at high temperature, high humidity conditions under fatigue strains.
- Studied the behavior of integrated nano-structured sensing materials coated over a flexible sensor array manufactured by roll-to-roll process.
- Built finite element models using ANSYS to study the high stress location distribution and validate the experimental findings.

(Aug '07- Dec '10) Lab Manager, Modeling, Intelligent Systems and Technology (MIST) Laboratory, Department of Systems Science and Industrial Engineering, State University of New York at Binghamton, Binghamton, NY.

- Studied the durability of PEM fuel cells and conducted an FMEA analysis to identify the failures in fuel cells.

- *Tested empirical models for fuel cell performance at different losses during fuel cell operations.*

Teaching Capabilities:

- *Quality Engineering, Total Quality Management, Regression and Least Squares Analysis, Design of Experiments and Data Analysis, Multivariate Data Analysis, Operations Research, Quality Control, Probability and Statistics, Reliability Engineering, Modeling and Simulation, Facilities Planning, Work Measurement and Analysis, Cost Accounting and Analysis, Production Planning and Inventory Control, Human Factors Engineering, Manufacturing Information Systems, Safety Engineering and Management.*

SCIENTIFIC AND PROFESSIONAL SOCIETY MEMBERSHIPS

- *Member, International Microelectronics and Packaging Society & the Microelectronic Foundation (IMPAS).*
- *Member, Surface Mount Technology Association (SMTA).*
- *Member, New York Academy of Sciences.*
- *Member, the Society for Information Display (SID).*
- *Watson Certificate in Electronics Packaging, Binghamton University.*
- *Member, Jordan Engineers Association (JEA).*

HONORS

- *Member, Alpha Pi Mu, (Industrial Engineering Honor Society).*
- *Doctoral scholarship from the Department of Systems Science and Industrial Engineering at State University of New York at Binghamton, USA, (2007-2010).*

PROFESSIONAL SKILLS

- ***Solar Cells Characterization Techniques:*** *Solar cell simulators, sheet resistance measurement system, spectroscopic reflectometer, and thin film thickness measurement systems.*
- ***Combined Structural Mechanics, Thermal and Electrical Modeling:*** *ANSYS, MatLab.*
- ***Mechanical Testing and Reliability Assessment:*** *High cyclic bending fatigue tools, MTS machines, accelerated thermal cycling, and electronic device testing and characterization.*
- ***Characterization Techniques:*** *Optical microscopy, SEM, and profilometers.*
- ***Modeling and Simulation:*** *AutoCAD, MatLab Simulink, and finite element modeling.*
- ***Knowledge and experience with:*** *PVD, PECVD, wet and dry etch, photolithography, thin film coating (spin coating, electroplating, sputtering, etc.)*
- ***Programming Languages:*** *C, C++, and Visual Basic.*
- ***Statistic and Management:*** *Minitab, SAS.*
- ***Statistical Process Control, Lean 6 sigma, and Design of Experiments***
- ***General Computer Skills:*** *Word, Excel, PowerPoint, and Access.*

PROFESSIONAL DEVELOPMENT WORKSHOPS AND SHORT COURSES

- ***Photolithography patterning:*** *Organized by AZORES at the Center of Advanced Microelectronics Manufacturing (CAMM), Endicott, Aug 2007.*
- ***Characterization of thin films printed on flexible substrates:*** *Organized by the Small Scale Systems Integration and Packaging (S3IP) Center at State University of New York at Binghamton, January 2008, training on optical microscopy, optical profile meters, stylus profilometer, and SEM tools.*
- ***Sputter deposition onto flexible substrates:*** *Organized by the Center of Advanced Microelectronics Manufacturing (CAMM) and Endicott Interconnect Technologies, August 2010.*

PROJECTS AND TECHNICAL REPORTS

- *Applied Multivariate Data Techniques “Factor Analysis”:* *Fuel cell performance modeling and prediction using regression analysis, Course of Applied Multivariate Data Techniques, Binghamton University, Fall 2008.*
- *Mechanical Reliability of Flexible Electronics: Term Paper, Course of Special Topics in Material Sciences “Flexible Electronics”, Joint course between Cornell University and Binghamton University, Fall 2008.*

- *Image Enhancement Using Digital Image Processing Techniques: Term Paper, Course of Special Topics in Material Sciences “Nano Technology”, Binghamton University, Spring 2008.*
- *Failure Modes and Effect Analysis “FMEA” in Health Care: Term Project, Course of Advanced Quality Control, Binghamton University, Fall 2007.*
- *Flexible Substrates Behavior under Cyclic Loading Using ANSYS: Term Project, Course of Finite Element Analysis, Binghamton University, Spring 2007.*

SAMPLES OF PUBLICATIONS

Journal Publications:

- 1- **Alzoubi, K.**, Alkhalzali, A., Choi, G., Hamasha, M., Albahri, S., DeFranco, J., Lu, S., and Westgate, C., “Comparisons of the Thermal Stability of Poly (3, 4-ethylenedioxythiophene) (PEDOT) and ITO on Flexible Substrates” *IEEE Transactions on Components, Packaging and Manufacturing Technology*, vol. 10, no. 8, pp. 1259–265, 2020.
- 2- **Alzoubi, K.**, “Parametric Study for a Reciprocating Screw Blow Injection Molding Process using Design of Experiments Tools,” *Jordan Journal for Mechanical and Industrial Engineering (JJMIE)*, vol. 10, no. 4, pp. 279-284, 2016.
- 3- Alkheder, A. S., Al Rajab, M. M., **Alzoubi K.**, “Parking problems in Abu Dhabi, UAE toward an intelligent parking management system “ADIP: Abu Dhabi Intelligent Parking,” *Alexandria Engineering Journal*, vol. 55, Issue 3, pp. 2679–2687, September 2016.
- 4- Hamasha, M. M., Dhakal, T., Vasekar, P., **Alzoubi, K.**, Lu, S., Vanhart, D., Westgate, C. R., “Reliability of Sputtered Deposited Aluminum-Doped Zinc Oxide under Harsh Environmental Conditions”, *Journal of Solar Energy*, Vol. 89, pp. 54–61, 2013.
- 5- **Alzoubi, K.**, Hamasha, M. M., Wang, L., Zhang, H., Yin, J., Luo J., Lu, S., Samakia, B., Zhong, C.-J., Poliks, M., “Stability of Interdigitated Microelectrodes of Flexible Chemiresistor Sensor Arrays,” *IEEE Journal of Display Technology*, vol. 8, no.7, pp.377-383, 2012.
- 6- Hamasha, M. M., **Alzoubi, K.**, Lu, S., Desu, S. B., “Durability Study on Sputtered Indium Tin Oxide Thin Film on Poly Ethylene Terephthalate Substrate,” *Thin Solid Films Vol. 519*, No. 18, pp. 6042-6047, 2011.
- 7- Hamasha, M. M., Dhakal, T., **Alzoubi, K.**, Albahri, S., Qasaimeh, A., Lu, S., Westgate, C. R. “Stability of ITO Thin Film on Flexible Substrate under Thermal Aging and Thermal Cycling Conditions,” *IEEE Journal of Display Technology*, vol. 8, no.7, pp. 383-388, 2012.
- 8- Hamasha, M. M., **Alzoubi, K.**, Switzer III, J. C., Lu, S., Poliks, M., Westgate, C. R., “Reliability of Sputtered Aluminum Thin Film on Flexible Substrate under Cyclic Bending Fatigue Conditions”, (In press: *IEEE Transaction on Components, Packaging and Manufacturing Technology*, Vol. 2, Issue: 12 , pp. 2007-2016, 2012.
- 9- Mayyas, A., Qasaimeh, A., **Alzoubi, K.**, Lu, S., Hayajneh, M., Hassan, A., “Modeling the Drilling Process of Aluminum Composites Using Multiple Regression Analysis and Artificial Neural Network,” *Journal of Minerals and Materials Characterization and Engineering*, vol. 11, pp. 1039-1049, 2012.
- 10- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., “Experimental Study of the High Cycle Fatigue of Thin Film Metal on Polyethylene Terephthalate for Flexible Electronics Applications,” *IEEE Transactions on Components, Packaging, and Manufacturing Technology*, vol. 1, no. 1, pp. 43-51, 2011.
- 11- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., “Factor Effect Study for the High Cyclic Bending Fatigue of Thin Films on PET Substrate for Flexible Displays Applications,” *IEEE Journal of Display Technology*, vol. 7, no. 6, pp. 348-355, 2011.
- 12- **Alzoubi, K.**, Hamasha, M. M., Lu, S., Samakia, B., “Bending Fatigue Study of Sputtered ITO on Flexible Substrate,” *IEEE Journal of Display Technology*. Vol. 7, No. 11, pp. 593-600, 2011.
- 13- Hamasha, M. M., **Alzoubi, K.**, Switzer III, J. C., Lu, S., Desu, S. B., Poliks, M., “A Study on Crack Propagation and Electrical Resistance Change of Sputtered Aluminum Thin Film on PET Substrate under Stretching,” *Thin Solid Films* vol. 519, no. 22, pp. 7918-7924, 2011.
- 14- Hamasha, M. M., **Alzoubi, K.**, Lu, S., “Behavior of ITO Thin Film on PET Substrate under Stretching,” *IEEE Journal of Display Technology*. Vol. 7, No. 8, pp. 426-433, 2011.
- 15- Lin, T.-H., **Alzoubi, K.**, Andros, F., Lu, S., “Numerical Assessment of Copper Column Flexible Flip Chip Technology,” submitted to the *ASME Journal on electronic packaging*, 2010.

Book Chapters

- 1- Hamasha, M. M., Dhakal, T., **Alzoubi, K.**, Westgate, C. R., “Reliability of Indium Tin Oxide: Properties under Mechanical and Thermal loads”, Book Title: *Indium: Properties, Technological Applications and Health Issues*, ISBN: 978-1-62257-700-2, Publisher: Nova Science Publishers, Inc. 2013.

Conference Publications and Presentations

- 1- **Alzoubi, K.**, and Alkheder, S. "Risk Exposure and Factor Effect Study of Selected Car Accident Parameters on Accident Severity" *Proceedings of the International Conference on Industrial Engineering and Operations Management*, Bangkok, Thailand, March 5-7, 2019.
- 2- **Alzoubi, K.**, Hijazi, H., Alkhateeb, A., *Facility Planning and Assembly Line Balancing in Garment Industry*, 2019 the 6th International conference on Frontiers of Industrial Engineering, Loughborough University London campus, London, UK, September 10-12, 2019. At: London, UK
- 3- **Alzoubi, K.**, Choi, G., Hamasha, M. M., Alkhazali, A. S., DeFranco, J., Lu, S., Sammakia, B. and Westgate, C. R., "Comparisons of the Mechanical Behaviors of Poly (3, 4-ethylenedioxythiophene) (PEDOT) and ITO on Flexible Substrates," *MRS Proceedings*, 1493, pp. 127–132. 2013.
- 4- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M. "Effect of Lamination on the High cyclic Bending Fatigue of Copper Thin Films on Flexible Substrates," *Advances in Display Technologies, Part of the SPIE International Symposium on OPTO*, January 22-27, 2011, San Francisco, USA.
- 5- Hamasha, M. M., **Alzoubi, K.**, Switzer III, J. C., Lu S., Westgate, C. R., Poliks, M., "Crack Development and Electrical Resistance Degradation of Aluminum Thin Film Deposited on Flexible Substrate under Cyclic Bending Fatigue Conditions," *Mid-Atlantic Microelectronics Conference and Exhibition, IMAPS*, July 23-24, 2011, Atlantic City, New Jersey, USA.
- 6- Hamasha, M. M., **Alzoubi, K.**, Switzer III, J. C., Tiberio, E. M., Lu S., Westgate, C. R., Poliks, M., "Stress Concentration and Crack Development of Deposited Titanium Oxides on Flexible Substrate for Solar Photovoltaic Applications," *Mid-Atlantic Microelectronics Conference and Exhibition, IMAPS*, July 23-24, 2011, Atlantic City, New Jersey, USA.
- 7- Hamasha, M. M., **Alzoubi, K.**, Dhakal, T., Qasaimeh, A., Lu, S., Westgate, C. R., "Stability of Aluminum Thin Films on Flexible Substrate under Thermal and Isothermal Conditions", *ISMTA Conference and Exhibition*, October, 16-20, 2011; Fort Worth, TX, USA.
- 8- Hamasha, M. M., Dhakal, T. **Alzoubi, K.**, Qasaimeh, A. Lu, S., Liu, X., "Stability of ITO Thin Film on Flexible Substrate under Thermal Aging and Thermal Cycling Conditions," *10th Annual Flexible Electronics and Displays Conference*, February 7-11, 2011, Phoenix Arizona, USA.
- 9- **Alzoubi, K.**, Hamasha, M. M., Wang, L., Zhang, H., Yin, J., Luo, J., Lu, S., Sammakia, B., Zhong, C. J., Poliks, M., "Stability of interdigitated Microelectrodes of Flexible Sensor Arrays," *10th Annual Flexible Electronics and Displays Conference*, February 7-11, 2011, Phoenix Arizona, USA.
- 10- Hamasha, M. M., Dhakal, T., **Alzoubi, K.**, Qasaimeh, A., Lu, S., Westgate C. R., "Stability of Aluminum Thin Films on Flexible Substrate under Thermal and Isothermal Conditions," *SMTA Conference and Exhibition*, October 16-20, 2011, Fort Worth, Texas, USA.
- 11- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., "Factors Effect Study for the High Cyclic Bending Fatigue of Thin Films on PET Substrate Using Design of Experiments Tools," *9th Annual Flexible Electronics and Displays Conference*, February 1-4, 2010, Phoenix Arizona, USA.
- 12- **Alzoubi, K.**, Qasaimeh, A., Lu, S., Sammakia, B., Poliks, M. "Resistance Change Modeling of Sputtered Thin Films on Flexible Substrates under Fatigue Test," *The 2010 Industrial Engineering Research Conference*, June 5–9, 2010, Cancún, Mexico.
- 13- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., "Experimental Study of the High Cyclic Bending Fatigue of Thin Film Metal on Polyethylene Terephthalate for Flexible Electronics Applications," *Proceedings of the ASME 2009 InterPACK Conference IPACK2009*, InterPACK2009-89247 pp. 27-32, July 19-23, 2009, San Francisco, California, USA.
- 14- **Alzoubi, K.**, Bhopte, B., Bhuvanesh, A., Chase, C., Hu, X., Moschak, P., Poliks, M., Sammakia, B., Santos, D., Steiner, J., Switzer, J., Yopez, D., Zhang, H. "A Continuous Roll-to-Roll Flexible Electronics Facility: Initial Characterization Efforts," *International Microelectronics and Packaging Society (IMAPS)*, New England Chapter 36th Symposium and Expo, Boxborough, MA, May 2009.
- 15- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., and Zhong, C. J., "Experimental Study of the High Cyclic Bending Fatigue of Thin Film Metal on Polyethylene Terephthalate for Flexible Electronics Applications," *Center of Advanced Microelectronics Manufacturing (Camm)*, Technical Advisory Board meeting, Binghamton, NY, April, 2009.
- 16- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., and Zhong, C. J., "Experimental Study of the High Cyclic Bending Fatigue of Thin Film Metal on Polyethylene Terephthalate for Flexible Electronics Applications," *International Microelectronics and Packaging Society (IMAPS) New England Chapter*, 36th Symposium and Expo, Boxborough, MA, May, 2009.

- 17- Mayyas, A., Qasaimeh, A., **Alzoubi, K.**, Lu, S., "Machinability Modeling for Aluminum Composite Drilling Process," *Proceedings of the 2009 Industrial Engineering Research Conference*, May 30 - June 3, 2009, Miami, USA.
- 18- Zhang, H., Poliks, M., Sammakia, B., Moschak, P., Chase, C., Bhuvanesh, A., Hu, X., Yopez, D., **Alzoubi, K.**, Santos, D., and Khasawneh, M., "Roll to Roll Photolithography Process for Fabrication of Large Area Flexible Interdigitated Electrodes," *International Microelectronics and Packaging Society (IMAPS) New England Chapter, 36th Symposium and Expo*, Boxborough, MA, April, 2008.
- 19- Luo, J., Njoki, P., Mott, D., Wanjala, B., Loukrakpam, R., Fang, B., Shi, X., **Alzoubi, K.**, Lu, S., Wang, L., Sammakia, B., and Zhong, C. J., "Nanostructured Bimetallic, Trimetallic and Core-Shell Fuel-Cell Catalysts with Controlled Size, Composition, and Morphology," *NSF Nanoscale Science and Engineering Grantees Conference*, 2008.
- 20- **Alzoubi, K.**, Lu, S., Sammakia, B., Poliks, M., and Zhong, C. J., "High Cyclic Bending Fatigue of Flexible Substrates," *Center of Advanced Microelectronics Manufacturing (CAMM), Technical Advisory Board meeting*, Binghamton, NY, October, 2008.
- 21- Molhim, M., Al-Jarrah, O., **Alzoubi, K.**, "Simultaneous Fuzzy Based Localization and Map Building for Mobile Robots," *Proceeding of the Third AUS International Symposium on Mechatronics (AUS-ISM06)*, April 18-20, 2006, Sharjah, and U.A.E.

Posters

- 1- M. M. Hamasha, **K. Alzoubi**, S. Lu, and S. B. Desu, "A Study of Electrical Resistance and Crack Development of Sputtered Aluminum Thin Film on PET Substrate under Stretching", *Flexible Electronics Symposium*, Binghamton University, Binghamton NY, August 17th, 2010.
- 2- M. M. Hamasha, **K. Alzoubi**, S. Lu, B. Sammakia, M. Poliks, S. B. Desu, "Experimental Study Of The High Cyclic Bending Fatigue Of Indium Tin Oxide On Flexible Substrate For Flexible Electronics Applications", *9th Electronics Packaging Symposium*, GE Global Research Center, Niskayuna, NY September, 2010.
- 3- M. M. Hamasha, **K. Alzoubi**, S. Lu, S. B. Desu, "A Study of Electrical Resistance and Crack Development of Sputtered Aluminum Thin Film on PET Substrate under Stretching", *Electronics Packaging Symposium*, GE Global Research Center, Niskayuna, NY September 9th, 2010.
- 4- M. M. Hamasha, **K. Alzoubi**, T. Dhakal, A. Nandur, S. Lu, C. R. Westgate, "Reliability Tests Of Thin Films For Solar Cell Applications", *CASP industrial day*, Binghamton University, Binghamton NY, November 8th, 2010.
- 5- M. M. Hamasha, **K. Alzoubi**, S. Lu, B. Sammakia, M. Poliks, S. B. Desu, "Experimental Study Of The High Cyclic Bending Fatigue Of Indium Tin Oxide On Flexible Substrate For Flexible Electronics Applications", *CASP industrial day*, Binghamton University, Binghamton NY, November 8th, 2010
- 6- M. M. Hamasha, **K. Alzoubi**, T. Dhakal, A. Nandur, S. Lu, C. R. Westgate, "Reliability Tests Of Thin Films For Solar Cell Applications", *10th Electronics Packaging Symposium*, Innovative Technologies Complex, Vestal, NY, October 10th, 2011.