

MAIN RESEARCH INTEREST:

Scientific Computation, Polymer Physics and Thermodynamics, Multi-Scale Modeling of Materials, Computer Simulation, Artificial Intelligence and Soft-Computing, Computer Vision and Image Analysis

EDUCATION:***Auburn University, Auburn, AL, USA (2006-2011)*****PhD in Polymer and Fiber Engineering,****May 2011***Research topic: "Synthesis and Modeling of Poly(L-lysine) Based Biomaterials for Regenerative Medicine"***Master in Polymer and Fiber Engineering,****Dec. 2009***Research topic: "Modeling the Coupled Heat and Moisture Transfer Through Hygroscopic Fibrous Materials"***Master in Chemical Engineering,****May 2009***Research topic: "Effect of Secondary Structure of Polypeptides on Properties of Their Nanocomposites"****Mansoura University, Mansoura, Egypt (1997-2002)*****Bachelor of Textile Engineering,****May 2002***Research topic: "Computer Applications in Spinning Mill Planning and Organizing"****Tutorial Workshop, EPFL, Lausanne, Switzerland (February 9-13, 2015)***

A training workshop on the "Hybrid Quantum Mechanics / Molecular Mechanics (QM/MM) Approaches to Biochemistry and Beyond" sponsored by the *Centre Européen de Calcul Atomique et Moléculaire (CECAM) headquarter at the Ecole Polytechnique Fédérale de Lausanne (EPFL)*

Fellowship Award, Huoston, TX, USA (February 7-10, 2010)

A fellowship in "Nano-Engineered Therapeutics I&II" sponsored by the *NSF Summer Institute on Nanomechanics, Nanomaterials and Micro/Nanomanufacturing*

Selected Coursework:

Polymer physics, Polymer thermodynamics, Polymer chemistry, Polymer rheology, Advanced analysis for transport phenomena, Biomedical Engineering, Advanced polymer processing, Advanced methods in polymer characterization, Structure and properties of polymers, Nanoscale science and technology

APPOINTMENTS:

Visiting Scholar, Department of Materials Science and Engineering, *McCormick School of Engineering and Applied Science, Northwestern University*, Evanston, Illinois, USA (May-June 2015):

- Conduct research on the multi-scale modeling of polymeric systems

Visiting Scholar, Department of Civil Engineering, *Ecole polytechnique fédérale de Lausanne (EPFL)*, Lausanne, Switzerland (February 2015):

- Conduct research on the CO₂ capture and sequestration (CCS) through geological storage
- Conduct research on the simulation of supercritical fluid's permeability across porous structures

Adjunct Professor, Department of Materials Engineering, *Technical University of Liberec, Liberec, Czech Republic* (March 2013–Present):

- Conduct research on the development of flexible aerogel materials with super-critical fluids
- Conduct research in the fields of scientific computations and artificial intelligence
- Conduct research on computer vision and image analysis algorithms
- Teach classes on programming and molecular modeling of polymeric materials
- Apply for research funding to the Grant Agency of the Czech Republic (GAČR)
- Supervise two PhD students, and co-supervise other students in the research group

Assistant Professor, Department of Textile Engineering, *Mansoura University, Mansoura, Egypt* (October 2011–Present):

- Developed the curriculum of three new engineering classes
- Conducted research on artificial intelligence and image processing for fault detection in textile materials
- Supervised graduation projects
- Initiated and organized the Textile Engineering Seminar Series (TESS)
- Coordinated the department work for getting the accreditation to the School of Engineering

Graduate Research Assistant, Department of Polymer and Fiber Engineering, *Auburn University, Auburn, Alabama, USA* (August 2006–August 2011):

- Conducted research in different projects (described below)
- Supervised the operation of some lab equipments

Teaching Assistant, Department of Textile Engineering, *Mansoura University, Mansoura, Egypt* (May 2004–July 2006):

- Tutored the recitation sessions
- Graded students assignments
- Held regular conferences with students coaching their senior projects

Production Engineer, Spinning division, *Oriental Weavers International Group, 10th of Ramadan City, Egypt* (October 2003–April 2004):

- Boosted the production of the department under my supervision by about 40%
- Designed the production plans for the spinning mill
- Supervised plans operation on the plant's floor (supervised four technicians and sixteen labors)

Planning Engineer, Garments division, *Aljazzar Co. for knitting and garments, Mansoura, Egypt* (August 2002–May 2003):

- Planned and managed the material flow in the plant

PUBLICATIONS: (The complete list is available upon request)

One (1) book, One (1) book chapter, nine (9) papers published in ISI journals, three (3) pending papers (under review), twenty three (23) published in international conference proceedings

TECHNICAL SKILLS

Trained and practiced many polymer characterization methods such as:

- Spectroscopic techniques: FTIR, RAMAN, UV-Vis, NMR
- Microscopic techniques: OM, SEM, AFM
- Thermal analysis: DSC, TGA, DMA, Rheometry
- Chromatographic techniques: GC/MS, GPC
- Surface chemistry techniques: AES, EDX, WDX, XPS, AP
- Other physical testing techniques: XRD, DLS, Viscometry, End group analysis, Zeta-potential, Particle size distribution
- Film and Membrane testing: Gas permeability, Pore size distribution
- Mechanical testing for fibers, yarns, fabrics, and composites

Practiced polymer processing:

- Polymerization methods (Ring opening living polymerization)
- Functionalization of single-walled and multi-walled carbon nanotubes
- Tissue engineered scaffold fabrication
- Polymers extrusion, Injection Molding, Compression Molding
- Electrospinning
- Melt and wet spinning

Computer Software:

- *Linux* operating system
- Programming using *Visual Basic* and *C* languages
- *Matlab* with a comprehensive understanding for many of its tool boxes
- Gaussian for *ab initio* and molecular mechanics simulations
- *NAMD* and *VMD* with their *Tcl* programming language for molecular dynamics simulation
- *Materials Studio* with its *Perl* programming language for molecular modeling
- *COMSOL Multiphysics* for modeling and simulation
- *AutoCAD* with its *AutoLISP* programming language for computer aided design
- Statistics and Quality Control software packages such as *JMP* and *SPSS*
- Multimedia (*photo*, *audio*, and *video*) editing and processing software

SCHOLARLY EXPERIENCE IN RESEARCH PROJECTS:

Primary Investigator for “**An Automated System for Fabric Faults Inspection to Enhance Textile Handicrafts**” a project funded by the Egyptian Academy of Scientific Research. *Mansoura University, Mansoura, Egypt*, 2012-2013 (Budget of \approx 25,000 USD):

- Developed an artificially intelligent automated system based on a computer vision system of image and video processing and artificial neural networks for detecting fabric faults and classifying the defects. The system records the faults in a database for quality control purposes and has the ability to find the source(s) of the faults and notify the maintenance personal for fixation
- Constructed a prototype for a new inspection machine equipped with the developed artificially intelligent inspection system

Researcher on “**Stress mapping around SWNT and MWNT in polymer-matrix nano-composites**” a project funded by U.S. Department of Commerce. *Auburn University, Auburn, AL*, 2008-2009 (Budget of \approx 50,000 USD):

- Functionalized the surface of single-walled (SWNT) and multi-walled (MWNT) carbon nanotubes by introducing functional groups to the surface that consequently covalently bind to the groups of the composite matrix
- Prepared the composite samples for the project and conducted the physical and mechanical testing on them

Researcher on “**Efficient biological-chemical protective materials**” a project funded by U.S. Department of Homeland Security and National Textile Center. *Auburn University, Auburn, AL*, 2006-2008 (Budget of \approx 1,000,000 USD):

- Conducted experimental testing for porosity of micro-porous membranes and their gas permeability using both manometric and volumetric methods
- Developed a new model for predicting the coupled heat and mass transfer through hygroscopic fibrous materials that studied, for the first time (to the best of my knowledge), the effect of fibers swelling during moisture absorption
- Conducted ASTM standard measurements for water vapor transmission rate (WVTR) through membranes of different materials and porosities

Researcher on “**Studying the interaction relations between fibers and yarns**” a project funded by the Egyptian Scientific Research Academy. *Mansoura University, Mansoura, Egypt*, 2004-2006 (Budget of \approx 200,000 USD):

- Developed a model to correlate the properties of the yarn to its structural fibers and to study the effect of processing conditions on the product qualities
- Developed “Spinning Mill Simulator (SMS)” software during this project that utilizes soft computing and artificial intelligence techniques, such as artificial neural networks (ANN), fuzzy logic (FL) simulators and genetic algorithm (GA) optimizer, to predict yarn properties from fiber attributes and to optimize the fiber characteristics to fit the desired yarn properties

Researcher on “**Campaign for developing Egyptian Textile Industry**” an initiative funded by the Egyptian Ministry of Trade and Industry. *Mansoura University, Mansoura, Egypt, 2004-2005* (Budget of ~ 700,000 USD):

- Trained engineers and technicians at selected companies (from the public sector as well as some participants from the private sector) on the new techniques in spinning and proper understanding and organizing of the spinning mill
- Implemented my previously (2002) developed software of “Spinning Mill Planning and Organizing (SMPO)” during the training courses. The software constructs spinning and production plans for spinning plants

PROFESSIONAL AFFILIATION:

2014 - present World Academy of Science, Engineering and Technology (Scientific and Technical Committee & Editorial Review Board on Materials Science and Engineering)

2009 - present American Chemical Society, *Division of Polymeric Materials Science & Engineering*

2002 - present Egyptian Engineering Syndicate

REVIEWING ACTIVITIES:

Reviewed manuscripts for the following international journals:

- Journal of Polymer Composites
- Journal of Expert Systems With Applications
- Journal of Industrial Textiles
- International Journal of Fuzzy System Applications (IJFSA)
- ACC Journal (journal of the Academic Coordination Centre, Nisa, Czech Republic)

SESSION CHAIR:

- *International Conference on Composites and Nanoengineering (ICCN 2014)*, Paris, France, April 28, 2014

TEACHING ACTIVITIES:**Course Coordinator for the following class:**

- TXE6114 Textile Materials (undergraduate level)
- TXE6215 Computer Applications II (undergraduate level)
- TXE6324 Computer Applications III (undergraduate level)
- TXE6126 Technical Writing (undergraduate level)
- TXE6425 Standards and Specifications (undergraduate level)
- TXE6427 Graduation Project (undergraduate level)
- Introduction to the multi-scale modeling of polymeric materials (graduate level)
- Computer programming and applications (graduate level)

Teaching Assistant for the following undergraduate classes:

- Machine design
- Engineering statistics
- Engineering drawing
- Quality control
- Computer programming applications
- Mill planning and organizing
- Modern methods of yarn spinning
- Short-staple yarn spinning

SUPERVISING ACTIVITIES:***Undergraduate students (diploma thesis supervisor):***

- Hadir Eldeeb
- Mahmoud Mohy
- Tamer Elbagoury
- Khaled Aboseda

PhD students (main supervisor):

- Muhammad Tayyab Noman (modeling and synthesis of the dye sensitizing solar cells DSSC)
- Promoda Kumar Behera (nano-particle applications for fire retarding applications)

UNIVERSITY SERVICE:**Participated in the following activities during the work at the Department of Textile Engineering, Faculty of Engineering, Mansoura University, Mansoura, Egypt:**

- A member of the Textile Engineering Department Council
- A member of the faculty's committee for the Accreditation and Quality Assurance
- A member of the faculty's management team in the Continuous Improvement and Qualifying for Accreditation Project (CIQAP)
- A member of the examination control committee at the department
- A member of the faculty's library management committee
- Organizing the weekly Textile Series Seminars at our department
- Supervising the department's computer lab
- Supervising students activities at the department's "Scientific Club" and the department's scientific trips

OUTREACH AND COMMUNITY SERVICE:

- Active contributor to workshops on developing the quality of Egyptian higher education
- Member of the organization committee for "The Annual Conference on Supporting the Small/ Medium Businesses and Enterprises", Mansoura University, Gamasa/MitGhamer, Egypt, 2005
- Organizer of food-for-hunger campaigns in Egypt and in Auburn, AL
- Community organizer to provide medical services to those in need at Egypt

CONCLUSION:

- Established diverse research background and technical skills
- Experienced in polymeric materials design, synthesis, characterization, and modeling
- Experienced in implementing soft-computing and computer vision techniques
- Experienced in teaching Engineering students (undergraduate and graduate levels)
- Proven to be self-motivated and independent worker
- Skilled in problem solving, collaborative working, and comprehending new ideas and techniques