

AMIR ABDELMAWLA AHMED

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EDUCATION

Ph.D. in Aerospace Engineering | Iowa State University | GPA-3.92/4.0 2019 – 2024

Thesis: Multiscale Deformation Analysis in Amorphous-Crystalline Metallic Composites

M.Sc. in Aerospace Engineering | Cairo University | GPA-3.5/4.0 2015 – 2019

Thesis: Generalized Crystal Plasticity Model of Hydrogen Embrittlement in Steels

B.Sc. in Aeronautical Engineering | Institute of Aviation Eng. & Tech. | GPA-3.4/4.0 2008 – 2013

Thesis: Design and Manufacturing of Small-Scale Vertical Axis Wind Turbine

WORK AND PROFESSIONAL EXPERIENCE

Graduate Research/Teaching Assistant | Iowa State University 2019 – present

Micro and Nano Mechanics Lab:

- Investigating the deformation behavior of high-toughness materials from atomistic to micro scale using nanoindentation experimental and computational techniques
- Integrating the atomistic model within a multiscale concurrent atomistic-continuum (CAC) framework to expand the atomic-based predictive capability, to facilitate the rational design of high-performance materials systems.
- Experimentally investigate the effect damage induced strain on the environmental attack of pipelines
- Developing a finite element framework to model and link the kinematics of the atavistically observed deformation mechanisms to the macroscopic fatigue response of the material
- Supporting teaching, prepare and conduct discussion classes for several applied solid mechanics courses with numerical and experimental labs.

Research Assistant | The British University in Egypt 2014 – 2019

Centre for Simulation Innovation and Advanced Manufacturing:

- Investigated the complicated phenomena of hydrogen embrittlement in steels and alloys and developed reliable multiscale physical-based computational models incorporating the effect of hydrogen solutes on the evaluation, mobility, and interactions of lattice defects, and correlating the hydrogen-defects interactions with the overall mechanical behavior of materials
- Coupled the proposed physical-based models with the finite element analysis (FEA) commercial package through user subroutines to the study plastic behavior of steels at the continuum level under the effect of hydrogen embrittlement.
- Worked on the development and utilization of multiple crystal plasticity models coupled with FEA to model the mechanical behavior materials and alloys under extreme environment conditions such as creep and radiation damage.
- Participated in writing successful proposals submitted to the Egyptian Academy of scientific research and technology (ASRT) and the Egyptian Technology Development Fund (STDF)

Centre for Advanced Materials:

- Worked on several funded projects to create design, manufacturing, installation, and testing platforms for small and mega- class vertical and horizontal wind turbines.
- Developed theoretical aerodynamic models to design and optimize the performance of Vertical Axis Wind Turbines (VAWTs).
- Conducted extensive 2D and 3D computational fluid dynamics (CFD) analyses to verify the theoretical models and to investigate the transient response of VAWTs towards assessing and improving the self-starting capabilities at low wind speeds.
- Performed wind tunnel tests to validate both theoretical and numerical analysis and to further assist the performance of designed VAWTs.
- Designed a novel individual-blade pitching mechanism for VAWTs using genetic optimization technique to maximize the generated power from the turbine.
- Created mechanical design models along with FEA using commercial packages for the structure of the turbine.
- Performed a complete mechanical design with detailed machine drawings for a subsonic low-speed wind tunnel for research and educational purposes
- Organized a successful technical workshop on the small wind energy made in Egypt to integrate efforts from academia and industry to enhance and facilities the design and production of small wind turbine prototypes to convoy the high-domestic demand.

PUBLICATIONS

Journal Articles:

- [1]. A. Abdelmawla, T. Phan, L. Xiong, A. Bastawros, “**Characterization of the interface between amorphous/crystalline metal composite**” to be submitted to Scripta Materialia
- [2]. A. Abdelmawla, T. Phan, L. Xiong, A. Bastawros, “**A combined experimental and computational analysis on how material interface mediates plastic flow in amorphous/crystalline composites**” Journal of Materials Research 36, 2816–2829 (2021)
- [3]. A. Abdelkader, A. Abdelmawla, “**A Novel Control Scheme for Pitch Regulated Vertical Axis Wind Turbines**”, Journal of Environmental Science 4, 1–8 (2015)

Selected conference proceedings and presentations:

- [1]. A. Abdelmawla, K. Kulkarni, A. Bastawros “**Role of Accumulated Plastic Strain on Grain Boundary Corrosion of Steel**”, The Minerals, Metals & Material Society (TMS) 150th annual meeting, February 2022, Anaheim, CA.
- [2]. A. Abdelmawla, T. Phan, L. Xiong, A. Bastawros “**Atomistic Simulation of Amorphous/Crystalline Metal Composite Interface Mechanical Behavior by Nanoindentation**”, The Minerals, Metals & Material Society (TMS) 150th annual meeting, February 2022, Anaheim, CA.
- [3]. A. Abdelmawla, T. Phan, L. Xiong, A. Bastawros “**Experimental and Modeling Characterization of Amorphous/Crystalline Metal Composite Interface Mechanical Behavior by Nanoindentation**”, 16th U.S. National Congress on Computational Mechanics, July 2021, Chicago, IL.

- [4]. A. Abdelmawla, A. A. Abdel-Fatah, B. M. Elhadidi, “**Improving the Starting Torque of H-Type Darrius Vertical Axis Wind Turbines**”, Proceedings of 13th International Conference of Fluid Dynamics, December 2018, Cairo, Egypt.
- [5]. A. Abdelmawla, T. M. Hatem, N. M. Ghoniem, “**Dislocation-Based Finite Element Model for Hydrogen Embrittlement in Steel Alloys**”, Proceedings of the Minerals, Metals & Material Society (TMS) 147th annual meeting, March 2018, Phoenix, AZ.
- [6]. K. Hamouda, A. Abdelmawla, T. M. Hatem, “**An Approach for Designing Vertical Axis Wind Turbines Using Numerical Methods and Genetic Algorithms**”, Proceedings of the 3rd International Conference on Numerical and Symbolic Computation Developments and Applications, April 2017, Guimarães, Minho, Portugal.
- [7]. A.A. Abdel-Fatah, A. Abdelmawla, “**A Novel Control Scheme for Pitch Regulated Vertical Axis Wind Turbines**”, International Conference on Environment and Renewable Energy, May 2015, Vienna, Austria.

COMPUTER AND TECHNICAL SKILLS

Varying experience with the following:

- **Solid Modeling & Finite Element:** ABAQUS, SOLIDWORKS, ANSYS, COMSOL
- **Materials Modelling:** LAMMPS, DAMASK, OVITO
- **Programming:** FORTRAN, C++, MATLAB, Maple
- **Computational Fluid Dynamics:** Fluent, CFX

HONERS AND AWARDS

TMS Student Travel Grant Award The Minerals, Metals & Materials Society	2022
Best Paper Award International Conference on Computational Fluid Dynamics	2019

TRAININGS AND OTHER EXPERIENCE

Attended the Iron & Steel Technology Conference AISTech , Nashville, TN	2021
Attended the meeting of the Society of Engineering Science SES , Saint Louis, MO	2019
Attended the 6 th school on high energy physics the British university in Egypt	2016
Completed the BASIC course for aircraft maintenance Egyptian Aviation Academy	2013
Summer training Baker Hughes , Egypt	2012
Internship in electronic injection cars KIA Motors Egypt	2012
Summer training in CAD modeling and simulation Jelecom Inc. , Egypt	2011
Summer training in airframe and jet engines Egypt Air , Egypt	2010

MEMBERSHIPS AND PROFESSIONAL SOCIETIES

Member The American Society of Mechanical Engineers (ASME)	2021 – present
Member The Minerals, Metals & Materials Society (TMS)	2021 – present
Member The U.S. Association for Computational Mechanics (USACM)	2021 – present
Member Materials Research Society (MRS)	2021 – present
Member American Society of Metals (ASM International)	2021 – present
Member The Association for Iron and Steel Technology (AIST)	2021 – present

Member | **The American Ceramic Society (ACerS)**

2021 – present

Member | **The Society of Hispanic Professional Engineers (SHPE)**

2021 – present

REFERENCES

Prof. Ashraf F. Bastawros

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