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Ogheneovo Idolor, Ph.D.

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Professional Profile

Dr. Idolor has broad expertise in the materials and mechanical engineering fields. He possesses hands-on experience in developing a non-destructive examination technique for polymer composites, application of spectroscopic techniques (FTIR, Raman, and dielectric spectroscopy), material characterization (stress-strain, fatigue), nondestructive examination (for polymers & polymer composite structures), rapid prototyping using Arduino microcontrollers, and statistical modeling (including machine learning techniques).

Dr. Idolor also has extensive experience in mechanical and piping design for processing facilities. He has applied and confirmed compliance with design codes and standards such as ASME BPVC, API, ANSI, and ASTM.

His PhD work in the department of Mechanical and Aerospace Engineering at North Carolina State University involved characterizing polymer-water interactions and leveraging the effect in developing a novel nondestructive examination technique for polymer composites. Via this work he developed specialized knowledge of the effects of moisture on polymers, and how to characterize the interaction using infrared spectroscopy and microwave-frequency dielectric spectroscopy. He also has hands-on experience with polymer composites and their nondestructive examination techniques, spectral analysis (qualitative and quantitative), statistical modelling such as machine learning, designing test setups, polymer mechanics, and rapid prototyping using Arduino microcontrollers.

Prior to graduate school, Dr. Idolor worked for over 5 years in the oil & gas industry, where he was involved with engineering design and construction of processing facilities. During these projects he was responsible for piping stress analysis, material specification and design of mechanical equipment including pressure vessels, storage tanks, and pig traps.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, North Carolina State University, 2021

M.S., Materials Science and Engineering, North Carolina State University, 2020

B.S., Mechanical Engineering, University of Benin, 2011

Prior Experience

Research Assistant, North Carolina State University, 2017–2021

Mechanical Engineer, Anbas Energy Systems, 2016–2014

Mechanical and Piping Engineer, Makon Engineering and Technical Services, 2014–2011

Professional Affiliations

American Society for Non-Destructive Testing (ASNT)

American Society for Composites (ASC)

Materials Research Society (MRS)

Publications

Idolor O. Leveraging Polymer-water Interactions for Damage Detection in Polymer Composites. North Carolina State University, 2021.

Idolor O, Guha R, Berkowitz K, Grace L. An experimental study of the dynamic molecular state of transient moisture in damaged polymer composites. Polymer Composites, 2021.

Idolor O, Guha R, Berkowitz K, Geiger C, Davenport M, Grace L. Polymer-Water Interactions and Damage Detection in Polymer Matrix Composites. Composite Part B: Engineering, 2021.

Berkowitz K, Guha R, Idolor O, Grace L. Impact Damage Detection Limits of Microwave NDE Technique for Polymer Composites. Proceedings of the American Society for Composites—Thirty-Sixth Technical Conference on Composite Materials 2021.

Guha R. D., O. Idolor & L. Grace. An atomistic simulation study investigating the effect of varying network structure and polarity in a moisture contaminated epoxy network. Computational Materials Science. 179: 109683. 2020.

Guha R, Idolor O, Berkowitz K, Grace L. Exploring secondary interactions and the role of temperature in moisture-contaminated polymer networks through molecular simulations. Soft Matter, 2021.

Idolor O, Guha R, Berkowitz K, Grace L. Damage Detection in Polymer Matrix Composites by Analysis of Polymer-Water Interactions Using Near-Infrared Spectroscopy. Proceedings of the American Society for Composites—Thirty-Fifth Technical Conference on Composite Materials 2020.

Idolor O, Guha R, Bilich L, Grace L. 2-Dimensional Mapping of Damage in Moisture Contaminated Polymer Composites Using Dielectric Properties. Proceedings of the American Society for Composites—Thirty-Fourth Technical Conference on Composite Materials 2019.

Guha R. D., O. Idolor & L. Grace. 2019. Molecular Dynamics (MD) Simulation of a Polymer Composite Matrix with Varying Degree of Moisture: Investigation of Secondary Bonding Interactions. Proceedings of the American Society for Composites—Thirty-Fourth Technical Conference on Composite Materials 2019.

Berkowitz K, Idolor O, Pankow M, Grace LR*. Combined effects of impact damage and moisture exposure on composite radome dielectric properties. Proceedings of SAMPE 2018 Conference and Exhibition. Long Beach CA.

Presentations

Idolor O, Grace L. Characterization of Damage in Polymer Matrix Composites by Analyzing Polymer-Moisture Interactions. Conference Presentation, American Society for Nondestructive Testing Annual Conference. November 2020.

Idolor O, Guha R, Berkowitz K, Grace L. Damage Detection in Polymer Matrix Composites by Analysis of Polymer-Water Interactions Using Near-Infrared Spectroscopy. Conference Presentation, American Society of Composites Technical Conference, September 2020.

Idolor O, Guha R, Berkowitz K, Grace L. Non-Destructive Examination of Polymer Matrix Composites by Analyzing Polymer-Water Interactions. Symposium Presentation, 3M RISE Symposium, August 2020.

Idolor O, Guha R, Berkowitz K, Grace L. Non-Destructive Examination of Polymer Matrix Composites by Analyzing Polymer-Water Interactions. Poster Presentation, Mechanical & Aerospace Graduate Research Symposium, North Carolina State University. March 2020.

Idolor O, Guha R, Bilich L, Grace L. 2-Dimensional Mapping of Damage in Moisture Contaminated Polymer Composites Using Dielectric Properties. Conference Presentation, American Society of Composites Technical Conference. Atlanta, Georgia. September 2019.

Idolor O, Guha R, Grace L. Damage Monitoring in Polymer Composite Materials using Dielectric Properties. Poster Presentation, Mechanical & Aerospace Graduate Research Symposium, North Carolina State University. March 2019.

Idolor O, Guha R, Grace LR*. A dielectric resonant cavity method for monitoring of damage progression in moisture-contaminated composites. Conference Presentation, American Society of Composites Technical Conference. Seattle, Washington. September 2018.

Urrea M, Idolor O, Grace LR. Characterization of freeze. thaw cycling induced damage in aircraft composites using dielectric properties. Poster Presentation, American Society of Composites Technical Conference. Seattle, Washington. September 2018.

Idolor O, Guha R, Berkowitz K, Grace L. Dielectric Properties and Characterization of Damage in Moisture Contaminated Polymer Composite Materials. Poster Presentation, Mechanical & Aerospace Graduate Research Symposium, North Carolina State University. March 2018.

Project Experience

Investigated causes of excessive vibrations in a mixed refrigerant multi-stage rotary compressor in a liquefied natural gas facility. Documented modifications to reduce forces and moments transferred to the compressor by piping. Ensured compressor and gear box were within the manufacturer’s recommended tolerances.

Investigated causes of an epoxy coating failure by delamination and effects of thermal cycling on long term coating performance in a nuclear power plant.

Designed experiments to measure engagement force and investigated its time-dependence for intravenous tubes used in a medical device. Performed statistical analysis of the data obtained and drew valid conclusions.

Peer Reviews

Thin-Walled Structures, Reviewer, 2021 – to date