

Emmanuel O. Doro

Career Interests

Application of first principles, computational analysis and experimental methods to model and analyze fundamental/applied process engineering problems in fluid mechanics coupled with heat and mass transfer. Particular interests include phase-change and multi-phase flows, combustion/reacting flows, thin films and free-surface flows, non-Newtonian flow and rheology, fluid-structure interaction, turbulence.

Education

- Aug. 2007 - **Ph.D. in Mechanical Engineering**, *Georgia Institute of Technology*, Atlanta, Georgia.
- Expected Graduation Date: Spring 2012
 - Dissertation Title: *Computational and Experimental Analysis of Falling Liquid Film Free Surface Evaporation*
 - Advisor: Cyrus K. Aidun (Professor)
 - GPA: 4.0/4.0
- 2005 – 2007 **M.Sc. in Mathematics**, *Royal Institute of Technology*, Stockholm, Sweden.
- Thesis Title: *Numerical Study of a Simple Model of Stochastic Phase Dynamics*
 - Advisor: Anders Szepessy (Professor)
 - GPA: 3.8/4.0
- 2003 – 2005 **M.Sc. in Mechanical Engineering**, *Royal Institute of Technology*, Stockholm, Sweden.
- Thesis Title: *Computational Models for Flow, Heat Distribution and Nitrogen Conversion in Catalytic Combustors*
 - Advisor: Reza Fahkrai (Asst. Professor)
 - GPA: 3.7/4.0
- 1994 – 1999 **B.Eng. in Chemical Engineering**, *University of Benin*, Benin City, Nigeria.
- Project Title: *Experimental Study of Rheological Properties of Drilling Fluids*
 - GPA: 3.4/4.0

Research Experience

- Fall 2011 **Research Assistant**, *Falling Film Pilot Plant Experimental Facility - Chalmers University of Technology*, Gothenburg, Sweden.

Experimental measurements of flow properties such as dominant frequency of hydrodynamic instability, film phase speed, film thickness of falling liquid films to validate predictions from CFD modeling and simulations. Flow measurement is based on Surface-Pattern Image Velocimetry (SPIV) with High Speed Digital Imaging.

Experimental measurements to develop rheology model for black liquor deformation based on dry-solids fraction, temperature and shear stress.

2007–present **Research Assistant**, *School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, Georgia.*

CFD modeling and simulations of falling film hydrodynamics, heat transfer and phase-change for Newtonian and Non-Newtonian liquids; Image analysis of Head-box forming jet flows; Simulations of flow through micro-fluid devices.

Spring 2007 **Research Assistant**, *Division of Nuclear Power Safety, Department of Physics, Royal Institute of Technology, Stockholm, Sweden.*

Studies on noise perturbed phase field models with application to solidification dynamics.

2004–2005 **Research Assistant**, *Department of Energy Technology, Royal Institute of Technology, Stockholm, Sweden.*

Experimental studies on catalytic combustion of gasified biomass using the high pressure catalytic combustion facility at EGI KTH.

Teaching Experience

Spring 2011 **Teaching Assistant - Fluid Mechanics (Undergraduate)**, *School of Mech. Engineering, Georgia Institute of Technology, Atlanta, Georgia.*

Gave selected lectures; responsible for conducting study sessions, administering and grading exams, and overall course administration.

Industry Experience

2001–2003 **KPMG Professional Services**, Lagos, Nigeria.

Assurance and Business Advisory:

Completed statutory audits and non-attest engagements for top energy companies in Nigeria; performed inventory verification and valuation.

2000–2001 **RivBay Oil and Gas Technologies**, Port-Harcourt, Nigeria.

Internship – Business Operations:

Reviewed company's health, safety and environment (HSE) policies to comply with industry standards; worked with sales team to prepare and present contract bids.

1998–1999 **Schlumberger**, Warri, Nigeria.

Internship – Well Construction Services (Cementing) Laboratory:

Simulation of down-hole conditions of oil wells; experimental verification of properties and quality of cementing slurries and drilling fluids.

May–Aug., 1996 **Warri Refining and Petrochemical Company**, Warri, Nigeria.
Internship – Fluid Catalytic Cracking (FCC) Laboratory:
Performed experiments to ascertain quality and specification of refined products.

Honors and Awards

Otto Kress Fellowship, Georgia Institute of Technology.
Swedish Institute Fellowship/Scholarship.

Numeric & Computer Skills

Finite Difference, Finite Element and Finite Volume Methods, CFD, C++, C, Scilab, MATLAB, OpenFOAM, FLUENT, Gnuplot, Git, Kile, Linux/UNIX, MPI, ParaView, L^AT_EX, Python, Fortran, Blender, MeshLab, TetGen, Eclipse.

Publications, Projects and Presentations

Interfacial Waves and the Dynamics of Backflow in Falling Liquid Films. Under review. (with Cyrus K. Aidun).

Computational Analysis of Wavy-Laminar Falling Liquid Film Free Surface Evaporation. Under review. (with Cyrus K. Aidun).

Falling Film Flow Structures of a Non-Newtonian Liquid. In preparation. (with Cyrus K. Aidun).

Influence of Buoyancy and Viscous Dissipation on Falling Film Flow Separation. In preparation (with Cyrus K. Aidun).

Numerical Simulation of Droplet Pinch-Off and Entrainment in a Micro-Fluid Device. (2010).

Image Analysis and Surface Velocity Estimation for Forming Jets using Cross Correlation (2010).

Parallelization of a Molecular Dynamics code for Lennard-Jones Liquid using Message Passing Interface (MPI) (2007).

Computation of Diffusion Coefficient for a Lennard-Jones liquid using Molecular Dynamics (2006).

Grid generation, Error Estimates and Adaptive Mesh Refinement using Finite Elements (2006).

Pseudo-spectra: Sensitivity of Eigenvalues (2005).

Modification of the Martinlaakso Cogeneration Power Plant (Helsinki): Investigation of the mechanical and environmental impact of replacing 30 percent of boiler coal with gasified biomass (2004).

Strategies for Promoting the Use of Renewable Energy (2003).

Workshop and Conferences

International Chemical Recovery Conference Williamsburg, Virginia, USA (2010).

Southeast Society for Industrial and Applied Mathematics (SIAM) Student Conference, Atlanta, USA (2010).

Introduction to High-Performance Computing - PDC Summer School, Stockholm, Sweden (2006).

Relevant Graduate Coursework

Mathematical Models, Analysis & Simulation, Numerical Methods for Stochastic Differential Equations, Mathematical Methods of Mechanics, Numerical Algebra, Numerical Solutions of Differential Equations, Applied Numerical Methods, The Finite Element Method, Computational Methods in Energy Technology, Computational Fluid Dynamics, Computational Physics, Program Construction for Scientific Computing, Introduction to High Performance Computing, Fluid Mechanics, Viscous Flow, Compressible Flow, Wave Motions and Hydrodynamic Stability, Combustion Theory, Principles of Thermodynamics, Molecular Thermodynamics, Conduction Heat Transfer, Mechanics of Paper Forming and Coating, Applied Reactor Technology and Nuclear Power Safety, Applied Heat and Power Technology, Measurement Technology, Introduction to Theory of Science and Research Methodology.

Affiliations

Technical Association of the Pulp and Paper Industry (TAPPI).

Stockholm International Research Association.

Nigerian Society of Chemical Engineers.