Adriana A. Alvarado

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Education

Louisiana State University (LSU), Baton Rouge, LA, USA **Exp. Dic/2026**

Engineering Science, Ph.D. GPA: 3.9/4.0

Concentration: Material Science

Advisor: Dr. Marwa Hassan.

Dissertation: Development, Durability, Interphase Performance of Novel Ternary Binder Concrete Applications: Materials Development and Design Framework

Coursework:

- Machine Learning
- Computational Chemistry
- Statistical Techniques
- Experimental Statistics
- Environmental Life Cycle Assessment
- Environmental Chemistry
- Fundamentals of Pavement Design
- Composite Materials: Manufacturing, Processing, and Design
- Advanced Sustainable Construction
- Mat Char-Elect Beam Methods
- Infrastructure Condition Assessment
- Deformation and Fracture of Engineering Materials
- Advanced Construction Technologies
- Geomaterials Analytical Techniques
- Advanced Concrete Theory
- Advanced Pavement Analysis and Design
- Material Characterization-Electron Beam Method
- Defects, Diffusion and Transformations in Solids
- Concrete Materials in Construction Emerging Concrete Technologies

Louisiana State University (LSU), Baton Rouge, LA, USA **Exp. Dic/2025**

Engineering Science, M.Sc. GPA: 3.9/4.0

Escuela Superior Politécnica del Litoral (ESPOL), Guayaquil, Ecuador **October/2017**

Chemical Engineering, Bachelor of Engineering GPA: 3.4/4.0

Research Expertise

- Advanced Materials Test Characterization
- Engineered Cementitious Composites (ECCs)
- Engineered Geopolymer Composites (EGCs)
- Supplementary Cementitious Materials (SCMs)
- Machine Learning
- Statistical Methods
- Cement Slurry for Wellbores
- Use of Nano Materials in Concrete
- Non-Destructive Testing
- Development of Sustainable Construction Materials
- Biomaterials

Peer-Reviewed Journal Articles

- **Abufarsakh, R., Noorvand, H., Hassan, M., Petroche, D. M., Ramirez, A. D., Arce, G., Radovic, M., Sukhishvili, S., Alvarado, A. A., Game, D., & Subedi, S. (2025).** Sustainable and Pseudo-Strain-Hardening Metakaolin and Fly Ash–Based Fiber-Reinforced Geopolymer Composites Activated with Potassium: Development and Carbon Footprint Analysis. Journal of Materials in Civil Engineering, 37(4), 04025062. https://doi.org/10.1061/JMCEE7.MTENG-18914
- **Alvarado A., Baykarab H., Riofrio, A., Cornejo, M. & Merchan-Merchan W. (2024).** Preparation, characterization, electrical conductivity, and life cycle assessment of carbon nanofibers-reinforced Ecuadorian natural zeolite-based geopolymer composites. Heliyon, Volume 10, Issue 6, e28079. https://doi.org/10.1016/j.heliyon.2024.e28079
- **Salazar R, Salas-Gomez V, Alvarado A. A., Baykara H. (2022).** Preparation, Characterization and Evaluation of Antibacterial Properties of Polylactide-Polyethylene Glycol-Chitosan Active Composite Films. Polymers, 14(11):2266. https://doi.org/10.3390/polym14112266
- **Baykara, H., Iza, P., Zarate, X. P. & Alvarado, A. A. (2020).** A Quantum Chemical Study of Small Molecules Used as Active Layer Component of Organic Solar Cells. Momento, (61), 62–74. https://doi.org/10.15446/mo.n61.87232

Technical Reports

- **Noorvand H., Murray C., Poblete, E., Alvarado, A. A. (2024)** "Advanced Concrete Materials for Rapid Infrastructure Repair and Rehabilitation." Project CY1-UARK-LSU-01, Southern Plains Transportation Center (SPTC).
- **Noorvand H., Radovic M., Hassan M., Alvarado A.A., Huang O. (2023)** "Calcined Clays as Alternative Supplementary Cementitious Material and Precursor for Geopolymer Binders in Transportation Infrastructure." Project 22CLSU13, Transportation Consortium of South-Central States (Tran-SET).
- **Noorvand H., Hassan M., Radovic M., Sukhishvili S., Arce G., AbuFarsakh R., Alvarado A.A, Huang O, Zhen S. (2022)** "Low-Cost Sustainable Engineered Geopolymer Composites (EGCs) for Repair and New Construction of Transportation Infrastructure." Project 21CLSU19, Transportation Consortium of South-Central States (Tran-SET).
- **Noorvand H., Radovic M., Hassan M., Sukhishvili S., Arce G., AbuFarsakh R., Alvarado A.A., Huang O., Zhen S. (2022)** "Development of Ultra-High Performance Engineered Geopolymer Composites (UHP-EGCs)." Project 21CLSU18, Transportation Consortium of South-Central States (Tran-SET).

Lectern Session Presentations

- **Alvarado A.A., Noorvand H., Murray, C., & Hassan M. (2024).** Replacing Portland Cement in Engineered Cementitious Composites (ECCs) with Calcium Sulfoaluminate (CSA) Cement for Sustainable Infrastructure Repair. ACI 123: Research in Progress. ACI Concrete Convention, March 24 to 29, 2024, New Orleans, LA.
- **Alvarado A.A. (2024)** Cultivating scientific curiosity: Exploring the impact of educational videos on elementary students' scientific knowledge. Division of Chemical Education. ACS Spring Conference. March 17 to 21, 2024, New Orleans, LA.

Poster Presentations

1. **Alvarado A.A., Noorvand H., Dhasmana, H., Berryman, C., Hassan M. (2026).** Performance of Mortar with High Biochar Content as Cement Replacement: Investigating the Influence of Feedstock, Particle Size, and Incorporation Method. Transportation Research Board 105th Annual Meeting, Washington D.C., USA. TRBAM-26-04888.

2. **Alvarado A.A., Noorvand H., Arce G, Murray, C., Manosalvas, C., Game D., H., Berryman, C. & Hassan M. (Accepted-2026).** Exploring the Effect of High Belitic Calcium Sulfoaluminate Cement as a Portland Cement Substitute in Engineered Cementitious Composites. Transportation Research Board 105th Annual Meeting, Washington D.C., USA. TRBAM-26-04844.
3. **Alvarado A.A., Noorvand H., Hassan M. (2025).** A Novel Ternary Blend: Enhancing Hydration and Strength with Biochar and Calcined Clay. ACI Concrete Fall 2025 Convention, Baltimore, MD, USA.
4. **Alvarado A.A., Noorvand H., Murray, C., Game D., H., Berryman, C. & Hassan M. (2025).** Investigating Belitic Calcium Sulfoaluminate Cement as Replacement for Portland Cement in Engineered Cementitious Composites. Transportation Research Board 104th Annual Meeting, Washington D.C., USA. TRBAM-25-04571
5. **Abufarsakh, R., Dhasmana, H. Noorvand, H., Ramirez, A., Hassan, M., Subedi, S., Arce, G., Sukhishvili, S., Radovic, M., Hassan M. (2025).** Evaluation of Different Fiber Types on Potassium and Sodium Activated Metakaolin Fly Ash Based Fiber Reinforced Geopolymer Composites. Transportation Research Board 104th Annual Meeting, Washington D.C., USA. TRBAM-25-04311
6. **AbuFarsakh R., Dhasmana, H., Noorvand H., Ramirez, A. A. Subedi, S., Zhen S., Huang O., Arce G., Sukhishvili S., Radovic, M. & (2025).** Enhancing the Mechanical Properties of Metakaolin-Based Engineered Geopolymer Composites Through Fiber Treatment. Transportation Research Board 104th Annual Meeting, Washington D.C., USA. TRBAM-25-04281.
7. **Game D., Noorvand H., Alvarado A.A., Hassan M., Giwa I., Louay M. (2024).** Sustainable High-Strength and Ultra-High Strength Engineered Cementitious Composites with Substitution of Fly Ash by Alternative Supplementary Cementitious Materials. Transportation Research Board 103rd Annual Meeting, Washington D.C., USA. TRBAM-24-05331.
8. **Alvarado A.A., Noorvand H., Subedi, S., Hassan M., Radovic M., AbuFarsakh R., Huang O. & Radovic, M. (2024).** Calcined Clays as Alternative Supplementary Cementitious Material in Concrete. Transportation Research Board 103th Annual Meeting, Washington D.C., USA. TRBAM-24-04576.
9. **AbuFarsakh R., Noorvand H., Alvarado A.A, Arce G., Subedi, S., Zhen S., Sukhishvili S., Hassan M. (2024).** Enhancing the Mechanical Properties of Metakaolin-Based Engineered Geopolymer Composites Through Fiber Treatment. Transportation Research Board 103rd Annual Meeting, Washington D.C., USA. TRBAM-24-03800
10. **Abufarsakh, R., Noorvand, H., Hassan, M., Petroche, D. M., Ramirez, A. D., Arce, G., Ramirez, A. A., Subedi, S., Radovic, M., & Sukhishvili, S. (2023).** Development and Carbon Footprint of Low-Cost Potassium Activated Metakaolin Fly Ash Based Engineered Geopolymer Composite. Transportation Research Board 102nd Annual Meeting, Washington D.C., USA. TRBAM-23-03671.

Professional and Academic Experience

Graduate Research Assistant **May 2022 – Present**
LSU, College of Engineering **Baton Rouge, LA, USA**

- Lead several funded research projects (>$400,000 worth) by controlling project quality, progress, schedule, and preparation of final delivery (presentation to the funding agency).
- Develop and conduct highly technical material test characterization from microlevel to macroscale.
- Produce 4+ technical reports, guidelines, and specifications as part of project delivery.
- Analyze datasets of geopolymer formulations to optimize reactant ratios, maximizing compressive strength and rheological performance.
- Synthesize nanomaterials and engineered cementitious composites, employing statistical analysis to optimize enhanced concrete durability.
- Develop and validate Machine Learning models' analysis to optimize concrete durability of binders, aggregates, and chemical admixtures developed by LTRC.

- Develop and validate Machine Learning models (extreme gradient boosting, extra trees regressor, Bayesian ridge) to predict ternary binder properties, identifying key variables that optimize hardening behavior and reduce experimental cycles.
- Execute comprehensive LCA using ReCiPe Midpoint (H), utilizing data modeling to quantify carbon footprints and drive sustainable material development.
- Test materials according to American Society for Testing and Materials standards and characterization techniques (SEM, TGA/DTA, XRD, XRF, UPV, UTM).
- Operationalize a concrete mixing laboratory, managing procurement data, inventory organization, and an operating budget of $120,000+.

Cement Field Engineer-Intern **May 2024 – August 2024**
Patterson-UTI Energy **Midland, TX, USA**

- Engineered a data-driven logistical framework for additive switching workflows, integrating hazard assessments and equipment requirements to optimize efficiency.
- Reduced project execution costs by $300,000 by shifting the operation from a manual, batch-based process to an automated, continuous process, improving control, safety, and efficiency.
- Analyzed fluid displacement telemetry (80-400 BBL/job) across 50+ operations to validate well integrity models and ensure 100% HSE compliance.
- Collaborated with bulk plant teams to optimize material sequencing and loading protocols, ensuring data integrity for field operation planning.

Chemistry-Intern **May 2023 – August 2023**
NexTier Completion Solutions **The Woodlands, TX, USA**

- Attained experimental data from 150+ slurry designs to model fluid loss and compressive strength, identifying non-linear performance trends.
- Spearheaded a strategic reformulation based on rheological analysis, resulting in a novel mixture that saved the company $1M+ annually.
- Optimized chemical additive ratios to achieve superior fluid loss reduction, validating results against standard formulation.
- Built a technical knowledge base of zonal isolation best practices, standardizing data inputs for future well-bore integrity projects.

Researcher and Teaching Laboratory Technician **May 2018 – May 2022**
Escuela Superior Politécnica del Litoral **Guayaquil, Ecuador**

- Conducted computational modeling using Density Functional Theory (DFT) (Gaussian 09/GaussView) to perform geometry optimizations and calculate minimum energy states.
- Simulated spectroscopic data (XRD, FT-IR, H-NMR, C-NMR) to predict molecular behavior and corroborate experimental findings.
- Engineered a novel conductive composite, reinforcing natural zeolite-based geopolymers with carbon nanotubes (CNTs) to create electrically active materials.
- Executed LCA studies to evaluate the carbon footprint and environmental viability of the synthesized geopolymer composites.
- Supervised and trained a cohort of 1,200+ undergraduate users in Physical and General Chemistry, ensuring strict adherence to operational protocols and instrumentation standards.
- Standardized laboratory operations by authoring the General Laboratory Safety Rules Guide, establishing the baseline compliance requirements for the department.
- Designed and documented 25+ Standard Operating Procedures (SOPs) and assessment metrics (quizzes/exams) to evaluate technical competency.

- Spearheaded the development of biodegradable chitosan/polylactide films for food packaging, successfully valorizing by-products from the shrimp processing industry.
- Led the scale-up of chitin and chitosan production from laboratory bench to an 80-gallon pilot plant.
- Managed laboratory operations, including procurement of reagents and equipment maintenance, ensuring zero downtime for critical project phases.
- Validated material quality through advanced characterization techniques, including XRD, FT-IR, SEM/EDS, and TGA/DSC.
- Supervised and mentored 2 research assistants, delegating experimental workflows and ensuring strict adherence to safety protocols.

Formulation Chemist and Entrepreneur **August 2021 – May 2022**
Cosmetic Products: The Lab **Guayaquil, Ecuador**
Developed, scaled, and delivered 22 custom cosmetic formulations, immersing from concept to commercial launch.

- Founded and operated a small-scale cosmetics venture, selling over 800 units, through strategic branding, formulation, and direct sales.

Honors & Awards

- Travel Award 2023, 2024, and 2025.
- January 08, 2024, Outstanding Research Paper, Transportation Research Board 104th Annual Meeting, Washington D.C., USA.
- Winner of the InnovAcción Challenge (2021): This is a program that offers the opportunity for professors, administrative staff and workers to learn, develop innovation skills and seek innovative solutions to the challenges faced by ESPOL.

Other Professional Activities

Leadership and Membership in Professional Organizations:

- Committee member of American Society for Testing and Materials (ASTM): Reviewer of standards belonging to Committee C01 Cement and Subcommittee C09.28 on Biochar for Use in Concrete.
- Treasurer American Concrete Institute Student Chapter at LSU.
- Graduate Student Association at LSU: Member of the Social Committee. Wellness week – Mental Health event planner and Global Initiative.
- American Society of Civil Engineers (ASCE)
- Society of Women Engineers (SWE)
- Society of Petroleum Engineer (SPE)

Journal Articles Reviewing

- Reviewer for Transportation Research Board
- Reviewer for Journal of Materials in Civil Engineering, ASCE
- Reviewer for Journal of Architectural Engineering, ASCE

Technical Skills

- Core Competencies: Machine Learning (ML), Predictive Modeling, Life Cycle Assessment (LCA), Design of Experiments (DoE), Sustainable Materials Development, Statistical Analysis.
- Programming & Software: Python (Pandas, Scikit-Learn), R, MATLAB, SQL, Ansys, OpenLCA, LaTeX.
- Instrumentation & Characterization: SEM, TGA/DTA, XRD, XRF, UPV, UTM / MTS Systems.

- Certifications: FLT, AWP, Class 7, RigPass, Hydrogen Sulfide Z390.1-2007, First Aid/CPR/AED.
- Languages: English (Fluent), Spanish (Fluent).