

**Zainab AFAILAL, PhD**  
**Senior R&D Technical Expert | Biomass & Biofuels**

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PhD Chemical Engineer and Senior R&D Technical Expert (10+ years) driving industrial decarbonization through thermochemical biomass/biofuel solutions (gasification, pyrolysis, HTP). Proven success designing protocols achieving 30% CO<sub>2</sub> reduction in €500K+ projects while ensuring EU regulatory compliance (RED II/III, ETS, CBAM). Having directed 300+ public events and managed 30+ member teams to 100% on-time delivery, I excel at stakeholder negotiation, crisis management, and operational excellence in technical settings. Authored 10+ peer-reviewed publications. Currently formalizing corporate project management skills for biomass/biofuel R&D scaling. Fluent in English, Spanish, French, Arabic.

## **PROFESSIONAL EXPERIENCE**

### **ENGIE Laborelec, Belgium (Oct 2024--present)**

#### **Biomass and green fuels Expert – Senior consultant**

- Led technical analysis for a €500K+ project on defossilization of metallurgical industry by substitution of coke by biocarbon (targeting 30% in CO<sub>2</sub> emissions reduction), optimizing the resources efficiency, characteristics and ensuring EU regulatory compliance. Manage stakeholder communications (2 industrial partners).
- Technical referent in biomass characterization, sourcing and pre-treatment for conventional gasification and hydrothermal gasification (€120K project), support R&D project coordination: stakeholder reporting, timeline tracking.
- Technical referent R&D project about the valorisation of waste from reversed osmosis desalination plant, (€100K project).
- Provided technical assistance for €1.9M+ R&D project on end-of-life wind blade valorisation by thermochemical processing (supported composite waste challenges).

### **GPT group, University of Saragossa, Spain (Jul 2023–Sep 2024)**

#### **Postdoc Researcher**

- Technical lead for advanced biofuel development (production of sustainable aviation fuels SAFs via HDO process), supported €290K project coordination (TRL 1-5).
- Contributed to public funding proposals and industrial collaboration.
- Managed 6 researchers in daily experimental workflows.
- Technical referent for a segment of €850K+ project about textile residues gasification, ensuring sustainable waste management and CO<sub>2</sub> utilization.

### **GPT group, University of Saragossa, Spain (Sep 2019–Jun 2023)**

#### **R&D Engineer**

- Performed advanced research in the field of biofuels production, biopolymers valorisation and renewable antioxidant additives production.
- Utilized thermochemical processes to produce biochar, bio-oil and syngas.
- Participation in international conferences and drafted technical patent and papers.
- Managed 4 Master's thesis projects and collaboration with international universities: (Wuhan, Khalifa and Bologna universities).

### **Creative Industries (Sep 2001–Dec 2021)**

#### **Professional Vocalist, Music Producer & Concert Organizer**

- Directed 300+ live events (budgets to €50K), resolving logistical crises and negotiating 60+ vendor contracts and media partnerships- applying PR agility and stakeholder management to technical projects.

### **University of Abdelmalek Essadi, Morocco (Oct 2014–Jan 2016)**

#### **Part-time Professor**

General and organic chemistry: courses, tutorials and presentations.

## **EARLY CAREER**

- Engineer (Master's thesis), Leader food (Mar 2014–Jun 2014): Optimized water/starch recycling and professional risk assessment in chips production line.

- Engineer, Moroccan Refining Industry Corporation (2011 & 2012): Oil products routine analysis and technical analysis for water treatment in demineralization and reverse osmosis desalination plants.

## EDUCATION

- Ph.D. in Chemical Engineering (Cum Laude - International recognition), University of Saragossa, Spain (2018–2023), Thesis title: "Exploring thermochemical routes for argan shells valorisation".
- M.Sc. in Industrial Chemistry, University of Abdelmalek Essaadi, Morocco (2012–2014), Academic equivalence: Spanish system.
- B.Sc. in Chemical Engineering, University of Abdelmalek Essaadi, Morocco (2008–2012).

## SKILLS

- **Technical Expertise:** Thermochemical Conversion (Gasification, Pyrolysis, HTP) | Reactor Systems (Fixed/Fluidized Bed, Auger, kiln, Autoclaves) | Analytical Methods (GC-MS, FTIR, NMR, TGA, ICP, XRD, CHN-S, SEC) | Biofuels and Biochar Production/Characterisation.
- **Project Coordination & Compliance:** Applied EU Regulatory Frameworks (RED II/III, ETS, CBAM) | Stakeholder Communication | Technical Reporting | Risk Assessment (VCA, Kinney, LMRA) | Budget Tracking.
- **Tools & Languages:** Salesforce CRM, Boondmanager | Design Expert, GraphPad, Microsoft Office, ESS, EDraw Max | Fluent: English, Spanish, French, Arabic, willing to learn Dutch and German.

## RESEARCH STAYS & LECTURES

- Lecturer: Thermochemical valorisation of biomass, Technical University of Munich (2024).
- Visiting Researcher: Lignin extraction and conversion into monomers via catalytic hydrogenolysis, Technical University of Denmark (2021).
- Visiting Researcher: Valorisation of N-rich biological residues for producing NH<sub>3</sub>, University of Saragossa: (2017 & 2018).

## CERTIFICATIONS & TRAINING

- **In Progress:** Corporate Project Management, Coursera.
- **In Progress:** Risk assessment HAZOP and ATEX zone calculations.
- **Safety compliance:** VCA (Feb 2025), BA4 (Apr 2025).
- Carbon footprint: methods/tools & Environmental impact assessment LCA (2022 & 2024).
- Laboratory accreditation according to ISO/CEI 17025 (2021).

## AWARDS & PUBLICATIONS

**Best scientific poster:** International Conference on Biofuels and Bioenergy (Italy, 2024) | 9<sup>th</sup> International Conference on Engineering for Waste and Biomass Valorisation (Denmark, 2022).  
**Best Oral Presentation:** X Conference of Young Researchers (Spain, 2021).

Full publication list is available at ORCID profile: [0000-0002-9091-672X](https://orcid.org/0000-0002-9091-672X)

1. C. Gracia-Monforte, **Z. Afailal**, et al. (2025). Textile waste valorisation via gasification: A comparative experimental study of different gasifying agents. *Biomass and Bioenergy*. DOI: 10.1016/j.biombioe.2025.107905.
2. I. Serrano, **Z. Afailal**, et al. (2024). Production of derivatives from wheat straw as reinforcement material for paper produced from secondary fibers. *Cellulose*. DOI: 10.1007/s10570-024-05731-0.
3. **Z. Afailal**, et al. (2023). Production of phenolic compounds from argan shells waste by reductive catalytic fractionation. *Biomass Conversion and Biorefinery*. DOI: 10.1007/s13399-023-04937-9.
4. **Z. Afailal**, et al. (2023). Production of antioxidant additives and high-quality activated biochar from pyrolysis of argan shells. *BioEnergy Research*. DOI: 10.1007/s12155-023-10652-0.
5. **Z. Afailal**, et al. (2023). Thermochemical valorisation of argan nutshells: torrefaction and air-steam gasification. *Fuel*. DOI: 10.1016/j.fuel.2022.125970.
6. **Z. Afailal**, et al. (2021). Antioxidant additives produced from argan shells lignin depolymerization. *Energy & Fuels*. DOI: 10.1021/acs.energyfuels.1c01705.

**Interests:** Traveling, hiking and music production.