

PhD in Process engineering

Research Topics

- ✓ Membrane filtration applied to the separation and purification of biobased high value-added molecules
- ✓ Lipids and emulsions :
 - Lipids recovery in microalgae biorefineries
 - Extraction, separation and characterization of neutral and polar lipids
 - Polar lipids as surfactants
 - Emulsification processes
- ✓ Physical chemistry of interfaces: study of oil/water and air/water interfaces. Tensiometry.
- ✓ Materials and coatings :
 - High temperature coatings and Steels for concentrated solar power technologies (Parabolic Trough and Solar Tower)
 - Thermal and structural analysis of solar receivers (Ansys Workbench simulation)

Present & previous positions

- Oct. 2017 - Present** **Researcher** at Chaire AgroBiotechnologies Industrielles (ABI) – AgroParisTech, Pomacle, France.
- Downstream processing: extraction, separation and purification of biobased molecules.
- Fractionation of complex mixtures by membrane processes.
- Nov. 2014 – Oct. 2017** **PhD Student in Chemical Engineering**, at GEPEA Laboratory UMR CNRS 6144, Saint Nazaire, France.
Project: Physicochemical study of a microalgae homogenate model and its lipids separation by membrane processes.
- April 2013 – Oct. 2013** **R&D Engineer** at Abengoa Solar New Technologies S.A. Madrid, Spain.
- R&D Project coordination and monitoring towards the achievement of project milestones. Building of new R&D proposals of collaborative projects (public and private institutions) to apply for public funding.
- R&D activities: Thermal and structural simulation of steel solar receivers to identify new alternative materials. Searching and testing of new high-temperature coatings for solar receivers.
- Patents writing and technology watching.
- Feb. 2008 – june. 2008** **Student in Internship** at Parque Científico de Madrid. Industrial Biotransformations Service. Madrid. Spain.
Project: Search for new microorganisms for the production of enzymes with industrial interest.
- June 2006 – july 2007** **R&D Engineer** at Carboquímica S.A. Bogota, Colombia.
Research activities: Development and performance evaluation of a PVC plasticizer for food contact applications.

Education

- 2014 - 2017** **PhD in Chemical Engineering**, Université de Nantes. GEPEA Laboratory UMR CNRS 6144. Saint Nazaire.
Thesis Title: Physicochemical study of a microalgae homogenate model and its lipids separation by membrane processes. Synopsis of Research: the project aimed to study the membrane fractionation of a synthetic mixture, representing a grinded microalgae suspension, for the recovery of lipids and to understand the role of the interfacial phenomena involved in the process at the liquid-liquid interface.
- 2012 - 2013** **Master Degree in Processes, Environment and Biotechnologies**
Ecole Centrale Paris, France.
Research project: Resveratrol bioproduction by grapevine cell culture. Université de Reims Champagne-Ardenne. Laboratory of plant stress, defense and reproduction SDRP.
- 2007 - 2009** **Master Degree in Biotechnology**, Aliter, Escuela Internacional de Negocios. Madrid, Spain. Fundación Carolina grant.
Dissertation topic: Business Plan for the production of bioplastic (PHAs) by a biotechnological process
- 1998 - 2004** **Chemical Engineer**, Universidad de América. Bogota, Colombia.
Final project: Production of agglomerated sheets from recycled materials.

Scientific production

Patents:

[1] **Patent WO/2012/089869: Method for in situ coating a tower solar receiver.** Clavijo Rivera E.; Martinez Sanz, N. ; Fernandez Quero V. ; Barragan Jimenez, J. Publication date: 05.07.2012.

Publication in peer-reviewed journal:

Mechanical cell disruption of *parachlorella kessleri* microalgae: impact on lipid fraction composition. E. Clavijo Rivera, V. Montalescot, M. Viau, D. Drouin, P. Bourseau, M. Frappart, C. Monteux, E. Couallier. Submitted.

Oral communications:

[1] **Understanding microalgae lipids recovery by membrane processes: cross flow filtration of a representative synthetic mixture (o/w emulsion).** Clavijo Rivera E., Villafaña López L., S. Liu, P. Bourseau, M. Frappart, C. Monteux, E. Couallier. 10th World Congress of Chemical Engineering WCCE. Barcelona, Spain. 1-5 october 2017.

[2] **Characterization of lipids produced by *Parachlorella kessleri*, cultured under nitrogen starving conditions.** E. Clavijo Rivera, V. Montalescot, M. Viau, D. Kucma, P. Bourseau, M. Frappart, C. Monteux, E. Couallier. RRB-12: 12th international Conference on Renewable Resources and Biorefineries. Gand - Belgium. 30 may - 1 June 2016.

[3] **Characterization of the lipid fraction of ground stressed *Parachlorella kessleri*. Formulation of a representative synthetic mixture.** E. Clavijo Rivera, V. Montalescot, M. Viau, D. Kucma, P. Bourseau, M. Frappart, C. Monteux, E. Couallier. OCEANEXT. Nantes - France. 08-10 June 2016.

[4] **Physicochemical study of a microalgae homogenate model and its lipids separation by membrane**

processes. E. Clavijo Rivera, P. Bourseau, M. Frappart, C. Monteux, E. Couallier. Annual seminar at GEPEA Laboratory. Saint Nazaire - France. June 2015

Posters:

[1] **Characterization of the fouling of an ultrafiltration polyethersulfone membrane fouled by an emulsion modelling lipids issued from Microalgae.** V. Drevet, S. Liu, E. Clavijo Rivera, L. Villafaña López, M. Frappart, E. Couallier, A. Szymczyk, M. Rabiller-Baudry. 11th International Congress on Membranes and Membrane Processes Conference information (ICOM 2017). San Francisco – United States. 29 July - 4 August 2017.

[2] **Filtration of an emulsion representing a grinded microalgae suspension for the concentration of lipids: Membrane selection and fouling characterization.** E. Clavijo Rivera, L. Villafaña López, S. Liu, V. Drevet, P. Bourseau, A. Szymczyk, M. Rabiller Baudry, M. Frappart, E. Couallier. Poster and flash Poster. MEMPRO 6. Saint Malo - France. 07-09 June 2017.

[3] **Filtration of an emulsion representing a grinded microalgae suspension for the concentration of lipids: Comparison of dynamic and tangential filtration.** L. Villafaña-López, S. Liu, E. Clavijo Rivera, P. Bourseau, E. Couallier, M. Frappart. MEMPRO 6. Saint Malo - France. 07-09 June 2017.

[4] **Fractionation of biomolecules from microalgae: characterisation of membranes fouled by lipids.** International Conference on Membranes in Drinking and Industrial Water Production MDIW 2017. S. Liu, V. Drevet, E. Clavijo Rivera, L. Villafaña López, M. Frappart, M. Rabiller Baudry, E. Couallier, A. Szymczyk. 6-8 February, 2017.

[5] **Physicochemical study of a synthetic mixture of grinded microalgae and its lipids separation by membrane processes.** CFM- Club Français de Membranes. E. Clavijo Rivera, V. Montalescot, M. Viau, D. Kuckma, P. Bourseau, C. Monteux, M. Frappart, E. Couallier. Poster and Flash Poster. Paris - France. 07 April 2016.

Teaching & Students Supervision

- ✓ Supervision of A. Mohd, DUT student. IUT Saint Nazaire. 2 months internship. 2017
- ✓ Supervision of S. Liu, M2 student. AgroParisTech. 6 months of internship. 2016 - 2017
- ✓ Teaching. 45h of Practical work: Fluid transport technologies. IUT Saint Nazaire. 2016 - 2017
- ✓ Supervision of J. Palacio, 5th year Chemical Engineering student. UNAL Bogota-Colombia. 6 months internship. 2006-2007

Skills

Extraction:

- ✓ Solid phase extraction (SPE)
- ✓ L/L extraction

Downstream processing:

- ✓ Membrane processes for separation and purification : MF, UF, NF

Analytical Methods:

- ✓ HPLC and GC

Physical chemistry of interfaces:

- ✓ Tensiometer, Langmuir Trough balance

Granulometry:

- ✓ Laser diffraction granulometry. Microscopic + image analysis.

Engineering Software:

- ✓ Ansys Workbench: Structural and Thermal Analysis

- ✓ Fluent
- ✓ Aspen Plus

Language

Spanish : Mother tongue

French : fluent

English : fluent

Professional associations

Since 2014 CFM, Club Français des Membranes.