Proposition de sujet de thèse CNRS-L/UPPA

2019-2020

II. Fiche de Renseignements sur le laboratoire d'accueil au Liban

Université ou centre de recherche : Université Libanaise

Laboratoire d'accueil : Laboratoire des Analyses Chimiques

Nom du Directeur du laboratoire : Pr. Chawki Saliba

Adresse : 90656 Jdeideth El Matn

Ville : Fanar

Tél./Fax/Mél : +961 1 681 552

Faculté ou organisme auquel est affilié le laboratoire d'accueil : Faculté des Sciences II

Nom du Directeur de thèse : Antonio-Carlo Razzouk

Le Directeur de thèse fait-il partie du laboratoire d'accueil : ☒ Oui / ☐ Non

Si non, précisez son rattachement et ses coordonnées :

- Principaux thèmes de recherche de l'équipe où sera effectué le travail de thèse :

  - Analyse de contaminants organiques et inorganiques dans les aliments ;
  - Etude des interactions entre les emballages et les aliments : études de migration, analyse des additifs dans les plastiques ;
  - Evaluation de la qualité des eaux de surface au Liban ;
  - Analyse des produits pétroliers dans l'eau ;
  - Développement d'outils chimiométriques pour extraire et interpréter l'information pertinente à partir des données complexes.

- Liste des publications récentes de l'équipe (pertinentes au sujet proposé- 3 dernières années) :

1. Lindemann, C., Duchet-Suchaux, P., Razzouk, A., Mokbel, I., and Jose, J. (**2016**). Liquid−Liquid Equilibria of Binary and Ternary Systems Methanol/Water + n‑Hexane, + n‑Octane, + n‑Dodecane, and + n‑Hexadecane in the Temperature Range between T = 283.15 K and T = 333.15 K. Journal of Chemical and Engineering Data, **61**, 2412−2418. DOI: 10.1021/acs.jced.6b00022
2. Daou, C., Nabbout, R., and Kassouf, A. (**2016**) Spatial and temporal assessment of surface water quality in the Arka River, Akkar, Lebanon. Environmental Monitoring and Assessment, **188**(12), 684. DOI: 10.1007/s10661-016-5686-4.
3. Daou, C., Salloum, M., Legube, B., Kassouf, A., and Ouaini, N. (**2018**) Characterization of spatial and temporal patterns in surface water quality: a case study of four major Lebanese rivers. Environmental Monitoring and Assessment, **190**(8), 485. DOI: 10.1007/s10661-018-6843-8.

La thèse sera-t-elle effectuée en co-tutelle ou co-direction : En co-direction

III. Fiche de Renseignements sur le laboratoire d'accueil à l'UPPA

Laboratoire d'accueil : IPREM

Nom du Directeur du laboratoire : R. Lobinski

Adresse : Hélioparc, 2, Avenue Angot

Code postale-Ville : 64053 Pau

Tél./Fax/Mél : +33 559 40 77 54 ryszard.lobinski@univ-pau.fr

Ecole doctorale auquel est affilié le laboratoire d'accueil : ED211

Nom du Directeur de thèse : R. Lobinski

Le Directeur de thèse fait-il partie du laboratoire d'accueil : **x** Oui / □ Non

Si non, précisez son rattachement et ses coordonnées :

Nombre de thèses dirigées (ou co-dirigées) actuellement : 4

Pour les cinq dernières années, précisez les thèses soutenues, la durée en mois pour chacune d'entre elle, la liste des publications et la situation actuelle de chaque diplômé.

2014 Hiba Abdallah (36 mois)
Analyse de multiresidues d'antibiotiques dans la viande alimentaire par la spectrométrie de masse de haute résolution
Emploi actuel : ATER à l'Université Libanaise de Beyrouth

1. Abdallah, H.; Arnaudguilhem, C.; Abdul Rahim, H.; Lobinski, R.; Jaber, F., Monitoring of twenty-two sulfonamides in edible tissues: Investigation of new metabolites and their potential toxicity. Food Chemistry 2016, 192, 212-217.
2. Abdallah, H.; Arnaudguilhem, C.; Lobinski, R.; Jaber, F., A multi-residue analysis of sulphonamides in edible animal tissues using QuEChERS extraction and HPLC-MS/MS. Analytical Methods 2015, 7, 1549-1557.
3. Abdallah, H.; Arnaudguilhem, C.; Jaber, F.; Lobinski, R., Multiresidue analysis of 22 sulfonamides and their metabolites in animal tissues using quick, easy, cheap, effective, rugged, and safe extraction and high resolution mass spectrometry (hybrid linear ion trap-Orbitrap). Journal of Chromatography A 2014, 1355, 61-72.

2014 Maria Aoun (36 mois)
Spéciation dans les métaux dans les organismes marins de la côte libanaise
Emploi actuel : cadre à la Commission d'Energie Atomique à Beyrouth

1. Aoun, M.; El Samad, O.; Bou Khozam, R.; Lobinski, R., Assessment of committed effective dose due to the ingestion of 210Po and 210Pb in consumed Lebanese fish affected by a phosphate fertilizer plant. Journal of Environmental Radioactivity 2015, 140, 25-29.
2. Aoun, M.; Arnaudguilhem, C.; El Samad, O.; Khozam, R. B.; Lobinski, R., Impact of a phosphate fertilizer plant on the contamination of marine biota by heavy elements. Environmental Science and Pollution Research 2015, 22, 14940-14949.

2017 Ivan Eb-Levadoux (36 mois)
Identification des ligands biologiques suite à l'exposition d'écrevisses à l'uranium

1. Eb-Levadoux, Y.; Frelon, S.; Simon, O.; Arnaudguilhem, C.; Lobinski, R.; Mounicou, S., In vivo identification of potential uranium protein targets in zebrafish ovaries after chronic waterborne exposure. Metallomics 2017, 9, 525-534.

2017 Shuanglong Wang (36 mois)
Spéciation des métaux dans les plantes : devenir des nanoparticules
Emploi actuel : assistant professor, University of Eastern China

1. Lhospice, S., Gomez, N.O., Ouerdane, L., Brutesco, C., Ghssein, G., Hajjar, C., Liratni, A., Wang, S., Richaud, P., Bleves, S., Ball, G., Borezée-Durant, E., Lobinski, R., Pignol, D., Arnoux, P., Voulhoux, R., Pseudomonas aeruginosa zinc uptake in chelating environment is primarily mediated by the metallophore pseudopaline, Scientific Reports, 2017, 7, 17132.
2. Wang, S. , Ouerdane, L., Hoekenga, O., Szpunar, J., Lobinski, R., Mass spectrometry-based analytical developments to link iron speciation to iron bioavailability in maize, Food Chem., 2019, in press
3. Ghssein, G., Brutesco, C., Ouerdane, L., Fojcik, C., Izaute, A., Wang, S., Hajjar, C., Lobinski, R., Lemaire, D., Richaud, P., Voulhoux, R., Espaillat, A., Cava, F., Pignol, D., Borezée-Durant, E., Arnoux, P., Biosynthesis of a broad-spectrum nicotianamine-like metallophore in Staphylococcus aureus, Science, 2016, 352, 1105-1109.

2017 **Sara Gutierrez-Sama** en co-direction avec B. Bouyssiere (36 mois)
Spéciation des métaux dans le pétrole
Emploi actuel : société privée

1 Putman, J.C., Gutiérrez Sama, S., Barrère-Mangote, C., Rodgers, R.P., Lobinski, R., Marshall, A.G., Bouyssière, B., Giusti, P., Analysis of Petroleum Products by Gel Permeation Chromatography Coupled Online with Inductively Coupled Plasma Mass Spectrometry and Offline with Fourier Transform Ion Cyclotron Resonance Mass Spectrometry, 2018, Energy and Fuels, 32, 12198-12204.
2 Gutiérrez Sama, S., Barrère-Mangote, C., Bouyssière, B., Giusti, P., Lobinski, R., Recent trends in element speciation analysis of crude oils and heavy petroleum fractions, 2018, TrAC - Trends in Analytical Chemistry, 104, 69-76.
3 Gutiérrez Sama, S., Farenc, M., Barrère-Mangote, C., Lobinski, R., Afonso, C., Bouyssière, B., Giusti, P., Molecular Fingerprints and Speciation of Crude Oils and Heavy Fractions Revealed by Molecular and Elemental Mass Spectrometry: Keystone between Petroleomics, Metallo-petroleomics, and Petrointeractomics, 2018, Energy and Fuels, 32 (4), pp. 4593-4605.
4 Gutierrez Sama, S., Desprez, A., Krier, G., Lienemann, C.-P., Barbier, J., Lobinski, R., Barrere-Mangote, C., Giusti, P., Bouyssiere, B., Study of the Aggregation of Metal Complexes with Asphaltenes Using Gel Permeation Chromatography Inductively Coupled Plasma High-Resolution Mass Spectrometry, 2016, Energy and Fuels, 30, 6907-6912.

5 Romão, W., Tose, L.V., Vaz, B.G., Gutierrez Sama , S., Lobinski, R., Giusti, P., Carrier, H., Bouyssiere, B., Petroleomics by Direct Analysis in Real Time-Mass Spectrometry, Journal of the American Society for Mass Spectrometry, 2016, 27, 182-185.

Principaux thèmes de recherche de l'équipe où sera effectué le travail de thèse :

- Le développement de connaissances fondamentales en physico-chimie, chimie analytique et microbiologie, en relation avec des applications concernant la structure du vivant,
- La gestion de l'environnement et les propriétés fonctionnelles de différentes classes de matériaux.

Liste des publications récentes de l'équipe (pertinentes au sujet proposé) :

1. Gutiérrez Sama, S., Barrère-Mangote, C., Bouyssière, B., Giusti, P., Lobinski, R., Recent trends in element speciation analysis of crude oils and heavy petroleum fractions, 2018, TrAC - Trends in Analytical Chemistry, 104, 69-76.

2. Putman, J.C., Gutiérrez Sama, S., Barrère-Mangote, C., Rodgers, R.P., Lobinski, R., Marshall, A.G., Bouyssière, B., Giusti, P., Analysis of Petroleum Products by Gel Permeation Chromatography Coupled Online with Inductively Coupled Plasma Mass Spectrometry and Offline with Fourier Transform Ion Cyclotron Resonance Mass Spectrometry, 2018, Energy and Fuels, 32, 12198-12204.

3. Kubica, P., Vacchina, V., Wasilewski, T., Reynaud, S., Szpunar, J., Lobinski, R., Rapid ion-exchange matrix removal for a decrease of detection limits in the analysis of salt-rich reservoir waters for fluorobenzoic acids by liquid chromatography coupled with tandem mass spectrometry, Analytical and Bioanalytical Chemistry, 2017, 409, 871-879.

4. Gutiérrez Sama, S., Farenc, M., Barrère-Mangote, C., Lobinski, R., Afonso, C., Bouyssière, B., Giusti, P., Molecular Fingerprints and Speciation of Crude Oils and Heavy Fractions Revealed by Molecular and Elemental Mass Spectrometry: Keystone between Petroleomics, Metallo-petroleomics, and Petrointeractomics, 2018, Energy and Fuels, 32 (4), pp. 4593-4605.

5. Romão, W.; Tose, L. V.; Vaz, B. G.; Gutierrez Sama, S.; Lobinski, R.; Giusti, P.; Carrier, H.; Bouyssiere, B., Petroleomics by Direct Analysis in Real Time-Mass Spectrometry. Journal of the American Society for Mass Spectrometry 2016, 27, 182-185.

6. Kubica, P., Garraud, H., Szpunar, J., Lobinski, R., Sensitive simultaneous determination of 19 fluorobenzoic acids in saline waters by solid-phase extraction and liquid chromatography-tandem mass spectrometry, Journal of Chromatography A, 2015, 1417, 30-40.

IV. Sujet de thèse

A faire signer obligatoirement par tous les co-directeurs

IV.1. Titre

Etude de la pollution des eaux souterraines et des sols par les stations-service au Liban : analyse de contaminants organiques et inorganiques.

Study of groundwater and soil pollution by gas stations in Lebanon: determination of organic and inorganic contaminants.

*La thèse fait-elle partie d'un projet de recherche financé par le CNRS-L : ☒ Oui / ☐ Non

Si oui, précisez :

Projet de recherche GRP CNRS-L/UL en cours :

Effect of petrol stations on the contamination of the environment: Determination of petroleum hydrocarbons in fresh water.

Chercheur principal: Antonio-Carlo Razzouk

*La thématique sous laquelle s'inscrit la thèse fait-elle partie des priorités de cet appel pour l'année 2019-2020 (voir annonce): ☒ Oui / ☐ Non

Si oui, précisez (possibilité de choisir plus qu'une) :

- Ressources aquatiques
- Environnement

Si non, définir une:

IV.2. Résumé (ne pas dépasser 200 mots)

In recent years, there is an increasing concern over groundwater and soil pollution by gas station effluents. Accidental leaks, spills and violations, rank gas stations among the most problematic for environmental pollution. In fact, old, damaged, rusty and poorly maintained petroleum underground storage tanks pose a serious environmental hazard, particularly in abnormal situations like an

earthquake. If petroleum leaks are significant, the contamination may reach groundwater and make it unsafe and unfit for human use.

The current operational practices in Lebanon and the lack of proper environmentally sound management in the ruling regulations lead to a very high risk of contamination from gas stations. In addition, the potential pollution from petroleum, petroleum by-products and waste oil may even go unnoticed because local water monitoring does not comprise these components. Therefore, the aim of the proposed thesis is at first to develop various qualitative and quantitative analytical methods for the evaluation of organic and inorganic contamination of soil and groundwater. The second objective is to conduct a survey aiming to assess soil and groundwater pollution by petroleum pollutants caused by gas stations effluents in Lebanon.

IV.3. Contexte et problématique (ne pas dépasser 200 mots)

Gas stations can be a major source of urban pollution. Oil leakage could occur in the underground facilities (underground storage tank, oil pipeline, etc.) caused by long-term use, lack of maintenance or material corrosion. In addition, during daily operations, accidental spills of gasoline and lubricants occur. Gas station cleaning water or rain can carry petroleum products into the soil and groundwater, posing a major health risk to residents and the environment. Some toxic and hazardous substances such as methyl tert-butyl ether (MTBE), benzene series (BTEX), polycyclic aromatic hydrocarbons (PAHs), heavy metals and other harmful substances in oil, can gradually diffuse into soil and aquifer, and cause significant risk to groundwater. Therefore, for the effective and efficient management of pollution, it is vital to have a complete understanding about the fate of petroleum products in an environment. To the best of our knowledge, a study on the pollution of soil and groundwater in Lebanon from gas stations has not been conducted to date. Thus, the composition and concentration of these pollutants in soil and water must be determined through various analytical methods to assess the levels of environmental pollution.

IV.4. Descriptif des objectifs et de l'impact (ne pas dépasser 200 mots)

In order to evaluate the risk and make decisions about potential hazardous effects of petroleum products and ensure the appropriate protection of the environment, it is very important to have a sound understanding of the toxicology, analytical science, environmental fate and behavior of these pollutants. Oil contamination in the environment is primarily assessed by measuring the chemical concentrations of petroleum products in the affected environmental compartment. The main goal of the proposed thesis is to design a sampling plan, develop and validate analytical methods permitting to reliably detect and quantify the petroleum products (e.g. C_{10} to C_{40} petroleum hydrocarbons, PAHs, BTEX, MTBE, degradation products, heavy metals...) in the soil and groundwater near selected gas stations in Lebanon. The considered methods will consist of targeted and non-targeted approaches allowing the screening of organic and inorganic contamination in soil and water systems. A variety of analytical techniques can be used in this context, among which gas and liquid chromatography, fluorescence and infrared spectroscopy. The obtained data will be interpreted by appropriate statistical and chemometric tools.

Furthermore, combining fingerprinting approaches and multivariate pattern-recognition techniques will allow a fast, simple and non-destructive tool for petroleum products determination. If the pollutant concentration is exceeding the control standard, necessary control measures must be taken to avoid the expansion of the pollution.

IV.5. Aspect appliqué et/ou aspect innovateur (ne pas dépasser 200 mots)

To our knowledge, no special monitoring activities or investigation studies have addressed so far the issue of the potential contamination from gas stations in Lebanon. The proposed study will assess the existence, distribution, and concentrations of petroleum products in soil and water resources and compare their concentrations to international standards or regulations. If the pollution is observed, emergency responses must be taken by the local authorities like surveys if the residents drink the groundwater, notify them that the water is polluted and suggest a substitute water source like bottled water. The suggested project conducted on the target stations may have implications for groundwater protection plans and future water-resources management policies in Lebanon. The study can be conducted on Jeita Spring, in Keserwan district, that supplies drinking water to the Greater Beirut Area, and which was assessed to be at very high risk of contamination from gas stations according to the report of BGR German-Lebanese Technical Cooperation project “Protection of Jeita Spring”.

IV.6. Etat des recherches dans le domaine avant la thèse (ne pas dépasser 200 mots) + Ref. Bibliographiques

As for 2014, nearly 500,000 leaking underground storage tanks have been confirmed in the United States, accounting for 1/4 of total underground storage tanks. In one survey of 3,500 tanks, about 9% of the service stations surveyed petrol was found on the top of groundwater in close proximity to station. Besides that, almost 2702 accidents between 1958 to 2007 in France occurred due to underground storage system failure. These problem challenges create an opportunity and need of continuous monitoring and inspection of soil and groundwater near petrol stations. For this purpose, numerous studies have been conducted worldwide aiming the measurement of various hazardous substances present in oil and the determination of their migration into soil and groundwater.

[1] A. Zubaira, M. Pappoeb, L. A. Jamesa, K. Hawboldt. Development, optimization, validation and application of faster gas chromatography – flame ionization detector method for the analysis of total petroleum hydrocarbons in contaminated soils. Journal of Chromatography A, 1425, 240–248 , 2015.

[2] O. P. Jiménez. Exploring petroleum hydrocarbons in ground water by double solid phase extraction coupled to gas chromatography–flame ionization detector. Talanta 131, 315–324, 2015

[3] A. J. King et al. Determination of polycyclic aromatic hydrocarbons in water by solid-phase microextraction–gas chromatography–mass spectrometry. Analytica Chimica Acta, 523, Issue 2, 259–267, 2004.

[4] M. Tankiewicz et al. Application and optimization of headspace solid-phase microextraction (HS-SPME) coupled with gas chromatography–flame-ionization detector (GC–FID) to determine products of the petroleum industry in aqueous samples. Microchemical Journal, 108, 117–123, 2013.

[5] M. V. Faustorilla, Z. Chen, R, Dharmarajan, and R. Naidu. Determination of Total Petroleum Hydrocarbons in Australian Groundwater Through the Improvised Gas Chromatography–Flame Ionization Detection Technique. Journal of Chromatographic Science, 1–9, 2017.

[6] R. M. Rosales, P. Martínez-Pagán, A. Faz, J. Bech. Study of subsoil in former petrol stations in SE of Spain: Physicochemical characterization and hydrocarbon contamination assessment. Journal of Geochemical Exploration, Volume 147, Part B, 306-320, 2014.

[7] H. Xiao et al., "Simultaneous Determination of MTBE and BTEX in the Groundwater of Gas Station by Head-Space-GC", Advanced Materials Research, Vols. 864-867, 973-977, 2014.

[8] M. Khanmohammadi, A. B. Garmarudi, M. de la Guardia. Characterization of petroleum based products by infrared spectroscopy and chemometrics. Trends in Analytical Chemistry, Vol. 35, 2012.

[9] H. W. Gu et al. A green chemometrics-assisted fluorimetric detection method for the direct and simultaneous determination of six polycyclic aromatic hydrocarbons in oil-field wastewaters. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 200, 93–101, 2018.

IV.7. Programme de recherche prévu pour la thèse et contribution des différents partenaires (ne pas dépasser 200 mots)

The Lebanese research team will be responsible of selecting an area to be studied and designing a sampling plan e.g. The Jeita spring which supplies water to most of the Beirut population. The study will include sampling, stabilization of samples, development and validation of analytical methods permitting to analyze some of the chosen hazardous substances in soil and water (e.g. total petroleum hydrocarbons using GC-FID, analysis of MTBE using SPME-GC-FID), carrying out pollution survey which consists of analyzing of water and soil samples from the selected region and statistical data treatment.

The French team will take care of methods development and validation for the remaining part of the organic hazardous substances e.g. the volatile petroleum substances and their degradation products by means of chromatographic techniques coupled to mass spectrometry. The heavy metals analysis and/or speciation in water and soil will also be optimized and validated. The potential pollution study will be conducted on collected samples near gas stations in Lebanon.

IV.8. Calendrier prévisionnel des mobilités

Months 1 to 6 (Beirut)

Bibliographic survey, sampling campaign, method development and validation for MTBE analysis.

Months 7 to 12 (Pau)

Method development and validation for the selected pollutants: organic contaminants (e.g. BTEX), their degradation products and trace heavy metals and/or speciation. Analysis of real samples by means of chromatographic methods coupled to spectrometric detection.

Months 13 to 18 (Beirut)

Statistical and chemometric data treatment for the obtained results, conducting a second sampling campaign, analysis of TPH and MTBE in soil and water samples.

Months 19 to 30 (Pau)

Organic pollutants and heavy metals analysis in samples.

Months 31 to 36 (Beirut)

Statistical and chemometric analysis of results, writing the manuscript and preparation for thesis defense.

IV.9. Diffusion/valorisation des résultats

The obtained results will be the subject of at least two publications in international journals. The student will present the results in international meetings in the form of poster or oral presentation.

IV.10. Compétences requises

The student should have a master's degree in petrochemical analysis, environmental or analytical chemistry. He/she should have a knowledge in chromatographic techniques. A knowledge of spectroscopic techniques, MS and/or ICP-MS would be advantageous.

Date 30/04/2019

Noms et signatures (directeurs de thèse)

Pr. Ryszard Lobinski ***Pr. Antonio-Carlo Razzouk***

Curriculum vitae of Ryszard Lobinski

Ryszard LOBINSKI
Born on 11 August 1963
Married, 3 children
Home address: 5, allée de Diane, 64140 LONS, France
Professional address:
IPREM, Hélioparc, 2, av. Pr. Angot, 64053 Pau, France
E-mail: ryszard.lobinski@univ-pau.fr
Phone: +33559407754

Degrees and titles

Combined engineer and master degree in chemical technology (Warsaw University of Technology), 1986
Ph.D. in analytical chemistry (Warsaw University of Technology), 1989
D.Sc. (*habilitation*) in analytical chemistry (Warsaw University of Technology), 1995
Professor of chemical sciences, title bestowed by the President of the Republic of Poland, 1999

Employment record

since 2000	research director (directeur de recherche 1ère classe since 2008) at the National Research Council of France (CNRS), University of Pau
1994-2000	research scientist (chargé de recherche) at the CNRS (1994-1997 University Bordeaux I, 1997- 2000 University of Pau)
1986 –	assistant, assistant professor (1994), associate (*extraordinary*) professor (1999) and full (*ordinary*) professor (2003) at the Warsaw University of Technology, Warsaw, Poland
1991 - 1994	senior scientist in "*Global Change*" and "*Eurocore*" programmes at the University of Antwerp, Belgium
1990	fellow of the Max Planck Society at the Institute of Applied Spectrochemistry and Spectroscopy in Dortmund, Germany (12 months)

Others:

Visiting professor at the Institute for Coastal Research, GKSS-Geesthacht, Germany (3 months in 2003)
Guest scientist at the Institute of Nuclear Chemistry and Technology (INCT) in Warsaw, Poland (3 months in 1989),
Visiting professor at the INCT (2 months in 2006)
Visiting professor at the Chuo University, Japan (1 month in 2008)

Principal positions:

2016 -	Director of the Institute of Analytical and Physical Chemistry for Environment and Materials, *Institut des Sciences Analytiques pour l'Environnement et les Matériaux,* IPREM – UMR 5254 (250 people), Pau, France
2007-2015	Head of the Laboratory of Analytical Bioinorganic and Environmental Chemistry (LCABIE, ex-UMR5034, 75 people)
1999-2008	co-founder (1999) and co-director (1999-2008) of Ultratrace Analyses

Aquitaine (UT2A, non-public service and consulting laboratory, 10 employees)

Other functions:

vice-president, president and past-president (2002-2008) of the Analytical Chemistry Division of IUPAC

Awards:

- Polish Prime Minister Biennial Scientific Award (1996)
- Silver medal of the National Research Council of France (*Médaille d'argent CNRS)* (2006)
- Admitted *Fellow of the Royal Society of Chemistry*, Cambridge (2007)
- Japan Society for the Promotion of Science Invitation Fellowship (2011)

Publishing record:

- 280 articles in peer reviewed journals
- 3 books and 3 edited journal issues
- 19 book chapters
- 130+ invited (plenary and keynote) lectures at international meetings

H-index: 60 (SCOPUS), 66 (Google Scholar)
Number of citations: >10000 (SCOPUS), >14,500 (Google Scholar)
Average journal impact factor: 4.1

Training record:

Supervisor of 29 Ph.D. theses and 15 post-doctoral fellows

Grants and industrial contracts:

more than 10 M€ (as Principal Investigator) since 1995

Antonio Carlo Razzouk

DATE OF BIRTH: 6 JUNE 1980, NATIONALITY: LEBANESE & FRENCH, ADDRESS: FURN EL CHEBBACK-BEYROUTH, PHONE: +961 70 99 71 54, E-MAIL: carlorazzouk@hotmail.com

Education

PHD IN ANALYTICAL CHEMISTRY | CLAUDE BERNARD UNIVERSITY - LYON I | 2003-2006

Study of Complex Mixtures at the Exit of a Natural Gas Conversion Reactor: Vapor Pressure Measurements and Analysis of Polyphasic Equilibria. (Sponsored by TOTAL Society)

MASTER'S DEGREE IN ANALYTICAL SCIENCES | CLAUDE BERNARD UNIVERSITY - LYON I |2003

Internship: Optimization of a Headspace-GC Method for organic volatile compounds analysis

BACHELOR'S DEGREE IN CHEMISTRY | LEBANESE UNIVERSITY - FANAR|2002

Experience

ASSISTANT PROFESSOR, ASSOCIATE PROFESSOR (2011), PROFESSOR (2018) | FACULTY OF SCIENCES-LEBANESE UNIVERSITY | 2008 TO PRESENT

Lectures & laboratory supervision: Trace analysis, on-line industrial analysis, chromatography, electrochemistry, mass spectrometry and analytical validation.

Research activities: Determination of chemical contaminants in food, migration study from plastic packaging into food, analysis of petroleum products in water.

QUALITY CONTROL CONSULTANT | BENTA PHARMA INDUSTRIES-DBAYEH | 2011-2014

- Managing analytical method development & validation activities
- Responsible for generation and update of GMP, GLP and ISO procedures

ASSISTANT PROFESSOR | HOLY SPIRIT UNIVERSITY-KASLIK | 2009 TO 2011

- **Lectures & laboratory supervision:** Chromatography, spectroscopy, general chemistry & chemistry of solutions.

LECTURER | LYON I- IUT A UNIVERSITY | 2008-2009

- **Laboratory supervision:** instrumental analysis and electrochemical methods.

POSTOCTORAL FELLOWSHIP |ANALYTICAL SCIENCES LABORATORY – LYON, FRANCE | 2007-2008

- Study of liquid-liquid equilibrium of ternary mixtures hydrocarbon/water/glycol by GC & GC-MS for gas hydrates inhibition in pipelines (Sponsored by TOTAL society)
- Analytical method development for determination of Zr & Hf by capillary electrophoresis

POSTOCTORAL FELLOWSHIP |ANALYTICAL SCIENCES LABORATORY – LYON, FRANCE | 2006-2007

· Determination of thermodynamic properties of petroleum compounds and mixtures (vapor pressure, K_{ow}, activity coefficient, solubility) by means of GC-FID, GC-MS & Karl Fischer coulometry

11 Scientific publications

The last 3 articles :

1. Cécile Lindemann, Pierre Duchet-Suchaux, Antonio Razzouk, Ilham Mokbel, and Jacques Jose. Liquid–Liquid Equilibria of Binary and Ternary Systems Methanol/Water + n-Hexane, + n-Octane,+ n-Dodecane, and + n-Hexadecane in the Temperature Range between T = 283.15 K and T = 333.15 K. Journal of Chemical and Engineering Data 2016, 61, 2412−2418.

2. J. García, R. Abou Naccoul, J. Fernandez, A. Razzouk, I. Mokbel. Vapor-Pressure Measurements and Modeling of Dipentaerythritol Ester Lubricants. Industrial & Engineering Chemistry Research, 2011, 50, 4231-4237.

3. A. Razzouk, R. Abou Naccoul, I. Mokbel, P. Duchet-Suchaux, J. Jose, E. Rauzy, and C. Berro Liquid-Liquid Equilibria for Monoethylene Glycol + Hexane and 2,2,4-Trimethylpentane, Water + Hexane and 2,2,4-Trimethylpentane, Monoethylene Glycol + Water + Hexane, and Monoethylene Glycol + Water + 2,2,4-Trimethylpentane in the Temperature Range between T = 283.15 K and T = 323.15 K. J. Chem. Eng. Data, 2010, 55, 1468–1472.

18 Oral communications & posters

The last 3 communications :

1. S. Noureddine ElMoussawi, K. Kosseife, S. El Khoury, A. C. Razzouk, C. Saliba. Determination of Phtalates in Lebanese Bread and its Plastic Packaging by HPLC-UV method. 21st LAAS International Science Conference «Horizon 2020: Advances in Sciences and Technology», Beirut, Lebanon April 15-17, 2015.

2. R. Abou Naccoul, I. Mokbel, A. C. Razzouk, E. Rauzy, J. Saab, N. Ouaini and J. Jose. Low Vapor Pressure (down to 10^{-6} Pa) Determination of 12 Anthropogenic Polycondensed Hydrocarbons Using Dynamic Saturation Apparatus with Online Detection. AIChE Annual Meeting: Nashville, Novembre 8-13, 2009.

3. R. Abou Naccoul, A. Razzouk, J. Saab, I. Mokbel, N. Ouaini, J. Jose. Sublimation and vapor pressures of heavy n-alkanes by gas saturation method. AIChE annual meeting: Philadelphia, Novembre 16-22 2008.

Research grants

2016-2018: Study of additives migration from packaging into food acquired on the Lebanese retail market. Project funded by Lebanese University.

2018-2020: Effect of petrol stations on the contamination of the environment: Determination of petroleum hydrocarbons in fresh water. GRP project funded jointly by CNRS-L and Lebanese University.

Supervision activities

20 Master's Degree students supervised.

Supervision of PhD student, Syreina Al Sayegh: Elaboration des membranes céramiques pour des applications photocatalytiques. 2018-present.

Languages

- **French:** Fluent
- **English:** Fluent
- **Arabic:** mother language

References: Available upon request