



# AMSIC Newsletter

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## Highlights

Editorial	p.1
AMSIC Activities	p.2
Our partners' corner	p.3
Announcements	p.4
AMSIC young talent	p.5
Africa and the COVID19	p.7
AMSIC network experts	p.9

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## AMSIC Newsletter Submissions

Please send news, announcements and other contributions for the newsletter to the

Editor, Dr. Sidy Ba:

[Sidy.Ba@USherbrooke.ca](mailto:Sidy.Ba@USherbrooke.ca)

Your contribution shall be included in the next issue of the newsletter.

## Editorial

by

**Courfia DIAWARA**

Professor of exceptional class  
Knight of the National Lion Order  
Assane Seck University of Ziguinchor



Science, technology and innovation are essential pillars for the socio-economic development of African nations, especially for those aspiring to become emerging countries. In this context, academic institutions and research centers are prioritizing public policies aimed to build knowledge for developing and testing innovative filtration materials, also leveraging their use for water treatment, blood purification and indoor air quality control.

Senegal, a coastal country situated in West Africa, is preparing to organize the World Water Forum in 2021. Senegalese leaders are committed to installing a seawater desalination plant exhibiting a capacity of 50,000 m<sup>3</sup> / day, starting year 2022.

It was therefore a perfect timing for the "African Membrane Society" (AMSIC) and its institutional partners to organize in Dakar a congress addressing the application of membrane technologies and to schedule more than 15 plenary and keynote sessions involving renowned university and industrial speakers.

Particular attention is paid to gender equity as we are targeting half of the plenary lectures to be presented by women. The local committee has already received 40 abstracts from Africa, America, Asia and Europe submitted for the oral sessions and posters. In parallel with the scientific venue, AMSIC-3 will host a training workshop for technicians focused on studying transfer mechanisms involving membranes, and techniques to power and operate a reverse osmosis pilot system. This training program, taught by the *Institut Européen des Membranes* in Montpellier (France), is a first of its kind in West Africa and could serve to kick-off a sub-regional Technician's Apprenticeship Center. A commercial exhibition will also be organized during this meeting in order to streamline the adoption of membrane and filtration processes on the African continent and to facilitate the emergence of local industrialization. Because of the COVID-19 pandemic, AMSIC meeting initially planned from the 3rd to 6th of November 2020 will be postponed to 2021. The new timeline for these Africa congress and technician training modules will be specified toward the end of August, this year. The organizing committees are honored to organize AMSIC-3 and look forward to welcoming you in Senegal in 2021. Please stay tuned as further information will be disseminated very soon.

Courfia DIAWARA  
Professor of exceptionnal class

## AMSIC Activities

### Activities within the research team of Prof. Raja Ben Amar

**Ms Hajer Aloulou, PhD** holder in chemistry, of the research team of Prof. Raja Ben Amar (photo opposite), has passed the 'MOBIDOC Post-doc H2020' competition (EU funded program) for the 'obtaining a scholarship for two years. This program requires a partnership with a professional. In this context, she will work with the SOPAL company, whose activity is the manufacture and surface treatment of parts for valves and household items. His subject is the treatment of wastewater by integrated systems using membrane processes.



This is the second time that a member of the team has benefited from this type of scholarship. The first was Ms. Nouha Tahri who worked on the treatment of wastewater from a textile facility in partnership with the company SITEX. This is a concrete example of the development and promotion of membrane technology within industry.

### Doctoral thesis defense under the supervision of Dr Nachida Kasbadji Merzouk (photo opposite)

**Ms. Aburideh Hanane** successfully defended a Doctoral Thesis under the supervision of Dr. Nachida Kasbadji Merzouk on March 11, 2020 at the Department of Process Engineering of Saad Dahleb University in Blida. The thesis is entitled:



## PREPARATIONS AND CHARACTERIZATIONS OF POLYMERIC MEMBRANES FOR APPLICATIONS IN WATER TREATMENT

### Abstract:

The performance of a membrane is a key factor in predicting its reliability. The design of membranes depends on their morphological and molecular characteristics for specific applications. This work focuses on improving the behavior of a cellulose acetate-polysulfone PSf-CA membrane in the presence of the additive PEG 400, at different concentrations, using thermal annealing at the surface of the membrane. The membrane was prepared by the NIPS (Non-solvent Induced Phase Separation) phase inversion process; the surfaces of the membrane films obtained were subjected to thermal annealing at 90 ° C. for 15 minutes. The influence of the composition of the polymer blend, the concentration of the additive and the effect of annealing on the performance of the membranes were studied. The membranes were characterized in terms of contact angle and mechanical strength, as well as by FTIR, DSC / ATG, SEM and MWCO cutoff. The SEM results suggest that the thermal annealing treatment resulted in NF membranes; the surface layers became denser and tighter, with a porous intermediate layer, these results were confirmed by the MWCO cutoff which is of the order of 300-500 Dalton for all treated membranes. The incorporation of PEG in the mixture increases the hydrophilic character and improves the value of the flow evolving from 14.3 L / m<sup>2</sup>h to 87.2 L / m<sup>2</sup>h by introducing 25% in PSf and 12% in PEG in the acetate membrane cellulose. The rejection of divalent and monovalent ions such as fluoride, metal ions as well as salts was also evaluated. The better flow membrane, MC (PSF / PEG / AC): (12/25/63) showed good retention of all ions except monovalent salts and met WHO standards. The treatment of purified wastewater from the Chenoua and Tipaza station and fluoridated brackish water from southern Algeria is giving promising results within the thresholds required by the NF membranes.

**Keywords:** Cellulose acetate, heat treatment, Nanofiltration (NF), Polyethylene Glycol (PEG), defluorination, mono-divalent ions.

**Reference:** Science, (2002) Vol. 86, 1749–1761.

***Our partners' corner***

**Prof. Anthony Szymczyk**  
Institute of Chemical Sciences of Rennes  
University of Rennes 1  
President of European Membrane Society (EMS)

Seven years have already passed after the first contacts between the council of the European Membrane Society (EMS) and the founders of the future African Membrane Society (AMS). It was officially born the following year, in 2014, and since then we have watched it grow with a heart full of joy and pride. Pride in our African colleagues who have risen to the immense challenge of bringing together and structuring a community across a continent as vast and diverse as the cradle of humanity. Of course, much remains to be done, but the machinery is in motion and Africa is brimming with vital forces that will be able to take over and take new steps to address major development issues in African countries through the use of membrane separations in key sectors such as water, health and the environment.

2019 was a year rich in exchanges between our two societies. The EMS is delighted to support the organization of the next edition of the AMS flagship conference, AMSIC-3 (Dakar, Senegal). Travel grants for students, free registration for early-stage-career academics as well as prizes for the best oral and poster presentations will be offered by EMS to reward young talents from the great Membranes family. On a personal note, it is with great pleasure that I will take part in this event, which is already shaping up to be a great moment in the collaboration between the AMS and the EMS.

The EMS also wishes to support other international conferences organized on the African ground. It will thus be present at the Second International Symposium on Nanomaterials and Membrane Science for Water, Energy and Environment (Tangier - Morocco) and will support this event through a student travel grant and a free registration for young academics.

As both societies show their willingness to intensify their collaboration, this gives me the opportunity to conclude this note by adapting a slogan that has become famous. Membranes have no borders!

**Anthony Szymczyk**  
**EMS President**

## **Announcements**

### ***Jobs and scholarship applications***

**Financial aid: Dr Godji Shangkum (Jos Plateau, Nigeria)** – If you have suggestions for obtaining financial aid (5,000 US dollars) to attend a training on Integrated Water Resources Management scheduled for 21st October-3rd Nov, 2020, at Galilee International Management Institute, Israel. This intention is born out of a sincere desire to gain more knowledge and skills from experts to address the water needs of my immediate community as well as for my future career growth.

**Access to analytical research equipment: Doctoral student Ameen Abdulrahman Babatunde (University of Ibadan, Nigeria)** – I am conducting research in the field of environmental chemistry by investigating the effect of landfill leachates on groundwater and surface water sources. I am urgently looking for academic collaborators who have direct access to high precision analytical instrument including X Ray Fluorescence, X Ray Diffractometry, FTIR for sediment analysis, al and Gas Chromatography Flame Ion Detector for identification of for phthalate esters and poly aromatic hydrocarbons.

### ***Patents and applications for patents***

Following a request from our readers, the AMSIC newsletter will start listing the applications and patents to which our members have actively participated.

#### **Professor Raja BEN AMAR (Department of Chemistry, Faculty of Sciences of Sfax, Tunisia)**

1. Patent N° SN08394, Procédé d'élaboration de membranes de filtration en carbone : Institut National de la Propriété Industrielle de Tunisie (INORPI), 2009.
2. Patent N° 16577, Procédé de fabrication de sirop de glucose à partir de matière première végétale. Institut National de la Propriété Industrielle de Tunisie (INORPI), 1993.
3. 3) Patent N° 16578 Procédé de fabrication de sirop d'isoglucose ; Institut National de la Propriété Industrielle de Tunisie (INORPI), 1993.
4. Patent N° FR2572660 (A1)<sup>o</sup>4, Procédé de destruction de l'ozone contenu dans un fluide ; ANVAR, France, <http://www.patfr.com/classification/B/08750>, 1986.

#### **Professor Michael Olawale DARAMOLA (University Witwatersrand, South Africa)**

1. Daramola, M.O., Silinda, B., Sandile, M. (2018) Acid mine drainage treatment means, US Patent Publication US2018/0296987A1.
2. Fayemiwo, O.M., Daramola, M.O., Moothi, K (2018) Biosorption of BTEX from aqueous solution using adsorbents synthesized from green tea leaves, South African Provisional Patent Application No. 2018/07838.

#### **Dr Abdoulaye DOUCOURE (Hollingsworth & Vose, USA; Guest speaker at the Faculty of Sciences and Techniques, Bamako, and at the Ecole Nationale d'Ingénieurs ABT. du Mali)**

1. US patent "UV treated membranes", US 7,611,629 (granted 2009)
2. US patent "Fine fiber filter media and processes", US 10,155,186 (granted 2019)
3. US App. "Stable filter media including nanofibers", US 20160303498 (pub. 2016)
4. US App. "Polyethersulfone fiber webs", US 20180290087 (pub. 2018)
5. US App. "Filter media having a fine pore size distribution", US 20200171418 (pub. 2020)

#### **Dr Sidy BA (Department of Rural Engineering, Water and Forests, Institut Polytechnique Rural de Formation et de Recherche Appliquée de Katibougou, Mali)**

1. OA Patent 19028, 2019. Système versatile de filtration lente sur sable pour la production d'eau potable. <http://www.oapi.int/Ressources/memoire/19028.pdf>.

**AMSIC young talent:**

**Hadi TOURÉ GUINDO**  
Project Coordinator  
Young Expert Programmes  
SOMAGEP, Mali

Mrs. GUINDO Hadi TOURÉ is a young professional in the water sector. She is a graduate of the University of Central Florida (UCF), and spent several years of research on the treatment of personal care products, pharmaceuticals and micropollutants by nanofiltration and reverse osmosis at the Environmental Systems Engineering Institute (ESEI) in Florida. Her research focused on the filtration of perfluorinated compounds (PFOA and PFOS) present in plastic materials and non-stick cookware. The objective of her Master's thesis was to evaluate the passage of perfluorinated compounds through flat-sheet nanofiltration membranes from a laboratory-scale water treatment apparatus. Her research was published in the scientific journal Water Supply (IWA).



In the United States, Hadi was involved in an NGO called (African Sky) to develop projects in the environment and health in Mali. Since 2016, Hadi has Coordinated the projects on waste awareness, training and mentoring of young girls in STEM (Science, Technology, Engineering and Mathematics) in rural areas in Mali. She was a facilitator of partnerships with STEMusso, a Malian association that advocates for young girls who are committed to pursuing a professional career in STEM. This is how the DIANA project was born, from a partnership between African Sky and STEMusso aiming to train 10 young girls of the Bambougou Nджи high school of Markala on the theme "Environmental Health".



This project consisted of multiple interactive and practical activities: personal development, public speaking, problem-solving on the theme of pollution of the Niger River and crafting of water filters. This activity has helped to develop the potential of these young high school girls by stimulating their intellectual curiosity and creativity throughout their training. The effects of the internship were felt in the field and it was found that the trainees were more open and more expressive at the end of the program. This experience allowed them to work in their school's laboratories, and use the microscopes, perform filtration efficiency tests and interpret the results as a group. Thus, after analyzing collectively the sources of pollution of the Niger River and identified some avenues to resolve this ecological crisis, all the trainees have made a commitment to be more responsible towards their environment.

Hadi has crossed the milestone of 'returning to Mali' in 2018, after spending 6 years in the United States. Employed at the Société Malienne de Gestion de l'Eau Potable (SOMAGEP) since 2018, she has been the coordinator of the Waterworx project (in partnership with a water company in the Netherlands), whose main objective is to facilitate access to drinking water and sanitation for 10 million people by the end of 2030 in 26 countries in Africa and Asia.

Hadi hopes to continue impacting and inspiring more people on water-related issues. The digitalization in the water sector and the use of innovative technologies such as membrane filtration are subjects that she is passionate about. She believes that it is the ideal way in Africa to promote the supply of drinking water in rural and semi-urban areas, facilitate wastewater recycling and enhance WASH systems for resilience to climate change issues. In joining AMSIC, Hadi wishes to bring her contribution to develop and support innovative projects in Africa, promoting a platform for sharing experiences to include youth and women in the water and sanitation sector.



**AFRICA'S PREPAREDNESS AND RESPONSE TO COVID-19 PANDEMIC**



**Professor Chimezie Anyakora, Bloom**  
Public Health; Director of Fund Raising AMSIC



**Gomotsegang Fred Molelekwa (PhD Eng)**  
Tshwane University of Technology  
South Africa; Director of Communications, AMSIC

People around the world are hard at work in an attempt to flatten the curve of COVID-19 infections, with the ultimate goal of stopping the spread of this pandemic that has caused hundreds of thousands of deaths and infected millions of others. COVID-19 is the most fearful and dreadful disease that has since become a pandemic of unimaginable magnitude, caused by a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) that affects the human respiratory system. This disease, which first emerged in the city of Wuhan, in the Hubei province, was declared on the 30th January 2020 by World Health Organization (WHO) an outbreak that constitutes a Public Health Emergency of International Concern. In Africa, SARS-CoV-2 has spread to dozens of countries within weeks. Governments and health authorities across the continent are striving to limit widespread infections. The experience of dealing with epidemics (i.e., preparedness and response), such as Cholera and Ebola is providing a strong platform for many African countries to manage the spread of COVID-19. Governments made timely decisions to enforce containment measures such as physical and social distancing, lockdowns alongside effective public health measures to test, trace and treat. This may have contributed to the experience in Africa where COVID-19 infections have not grown at the same exponential rate as in other regions and so far the region has not experienced the high mortality seen in some parts of the world.

Since the emergence of the pandemic, WHO has been giving tremendous support to African governments in many ways, including the capacity to test, surveillance efforts, supportive treatment and health worker training. To date, more than 10 000 health workers have been trained in infection prevention and control, treatment, logistics, laboratory testing, public health education, and other key areas. In addition, WHO Regional Office for Africa has repurposed over 900 staff at the regional and country levels to support the COVID-19 response. By the end of May 2020, 45 of the 47 countries in the WHO African Region can test for COVID-19, up from just two when the outbreak started. It is reported that for the remaining two countries, WHO will deliver essential laboratory equipment and supplies to establish testing. However, the basic preventative measures by individuals and communities remain the most powerful tool to prevent the spread of COVID-19. These include, but not limited to, using respiratory face masks, regular hand washing with water and soap, hand sanitizing, and social distancing. However, the central point that is placed in the spotlight is the need for clean drinking water for all. Existing WHO guidance on the safe management of drinking water and sanitation services applies to the COVID-19 outbreak. Access to clean and safe water and sanitation is critical and is indispensable to avoid the spread of the coronavirus and fight COVID-19. Heads of State, Government, and leaders from United Nations agencies, International Financial Institutions, civil society, private sector and research and learning are mobilizing around a call for prioritizing water, sanitation and hygiene in response to COVID-19. Water, sanitation and hand hygiene, together with physical distancing, are central to preventing the spread of COVID-19, and a first line of defense against this serious threat to lives and health systems. Therefore, many health co-benefits can be realized by safely managing water and sanitation services, and by applying good hygiene practices. However, handwashing with water and soap, or preferably alcohol (60% or more), kills the virus but requires access to running water in sufficient quantities. This aspect resonates particularly strongly with the African Membrane Society's (AMSIC) core mission. The mission of the African Membrane Society is to train a critical mass of experts in the field of membrane science, filtration and sustainable energy technologies across Africa. This mission is very much in line with the global goal to flatten the curve of Covid-19 infections.

To that effect, AMSIC advocates for implementation of several measures to ensure access (accessibility) to sufficient (quantity) clean drinking water (quality) at all times (availability). Therefore, various water treatment technologies must be utilized to realize this goal as well as the goal of curbing the spread of COVID-19. Furthermore, African countries need to increase the uptake of membrane technologies, especially ultrafiltration, nanofiltration and reverse osmosis to increase their respective water supply

coverage of their communities, especially those in rural areas, informal settlements with no connection to the main water supply network. They can use decentralized membrane filtration system to achieve this in a very short space of time compared to conventional water treatment infrastructure. This could be at a community or a household level. To this end, education and awareness-raising programs should be rolled out to communities to ensure that treated water is safely stored at home in regularly cleaned and covered containers. Furthermore, the authorities must ensure that communities use water sparingly and protect water sources and infrastructure during this time of the COVID-19 pandemic. These measures should be effectively planned, implemented and monitored.

It is befitting to conclude with the quote pertaining to the call by the leaders of the world for the provision of clean drinking water, which says “Leaders that recognize the role of water, sanitation and hygiene in preventing the spread of COVID-19, will save lives. Leaders that prioritize international collaboration and support, will save lives. We are only as healthy as the most vulnerable members of society, no matter in which country they are”.



**AMSIC network experts****Prof. Dr Saad Alami Younssi**

Prof. Dr Saad Alami Younssi  
 Laboratory of Materials Membranes and Environment, Director  
 Moroccan Membrane and Desalination Society, President  
 Faculty of Sciences and Technologies of Mohammedia  
 University Hassan II Casablanca, Morocco  
[smmdalami@gmail.com](mailto:smmdalami@gmail.com) ; [alamiyounssisaad@yahoo.fr](mailto:alamiyounssisaad@yahoo.fr)



Saad Alami Younssi received his PhD in Inorganic Chemistry and Analytic Chemistry in 1994 at the University Montpellier 2, France. He became Assistant Professor (1996), and then Professor at the University Hassan II of Casablanca, Morocco. Between 2006 and 2013, he held the position of Vice Dean in charge of pedagogy at the Faculty of Sciences and Technologies of Mohammedia.

In 2013, he has been Director of the Laboratory of Materials Membranes and Environment at the University Hassan II of Casablanca and he is a member of the Moroccan Analytical Chemistry for Sustainable Development Association. In January 2018, He has been President of the Moroccan Membrane and Desalination Society and he is a member of the African Membrane Society in Mars 2018. His research interests include elaboration and characterization of inorganic and composite microfiltration, ultrafiltration and nanofiltration membranes as well as transfer salts through microporous membranes. He has published more than 63 articles in SCOPUS-indexed journals.

**Some Publications and Chapters 2018-2020**

- 1- M. Breida, S. Alami Younssi, A. Bouazizi, B. Achiou, M. Ouammou and M. El Rhazi; Nitrate removal from aqueous solutions by  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> ultrafiltration membranes; *Heliyon* 4 (2018) 498-508.
- 2- H. Bensalah, M.F. Bekheet, S. Alami Younssi, M. Ouammou, and A. Gurlo; Hydrothermal synthesis of nanocrystalline hydroxyapatite from phosphogypsum waste; *Journal of Environmental Chemical Engineering* 6 (2018) 1347-1352.
- 3- S. Saja, A. Bouazizi, B. Achiou, M. Ouammou, A. J. Albizane, Bennazha, S. Alami Younssi; Elaboration and characterization of low-cost ceramic membrane made from natural Moroccan perlite for treatment of industrial waste water. *Journal of Environmental Chemical Engineering*, 6(1), (2018), 451-458.
- 4- A. Karim, B. Achiou, A. Bouazizi, A. Aaddane, M. Ouammou, M. Bouziane, J. Bennazha, and S. Alami Younssi; Development of reduced graphene oxide membrane on flat Moroccan ceramic pozzolan support. Application for soluble dyes removal; *Journal of Environmental Chemical Engineering* 6 (2018) 1475-1485.
- 5- S. Alami Younssi, M. Breida, B. Achiou, Alumina membranes for desalination and water treatment. Chapter 2018; Intech "Desalination And Water Treatment", ISBN 978-953-51-6214-8.
- 6- M. Breida, S. Alami Younssi, M. El Rhazi, M. Bouhria; Removal of heavy metals by tight  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> ultrafiltration membrane at low pressure; *Desalination and Water Treatment*, 167(2019) 231-244.
- 7- G. Derouich, S. Alami Younssi, J. Bennazha, B. Achiou, M. Ouammou and A. Albizane; Adsorption study of cationic and anionic dyes onto Moroccan natural pozzolan. Application for removal of textile dyes from aqueous solutions; *Desalination and Water Treatment*, 145 (2019) 348-360.
- 8- M. Breida, S. Alami Younssi, M. Ouammou, M. Bouhria, M. Hafsi; Pollution of water sources from agricultural and industrial effluents -Special attention to NO<sub>3</sub><sup>-</sup>, Cr(VI) and Cu(II). Chapter 2019; Intech "Water chemistry", ISBN 978-1-78985-558-6
- 9- G. Derouich S. Alami Younssi J. Bennazha, J. Cody, M. Ouammou, M. El Rhazi; Development of low-cost polypyrrole/sintered pozzolan ultrafiltration membrane and its highly efficient performance for congo red dye removal; *Journal of Environmental Chemical Engineering* 8(3) (2020) 103809.
- 10- H. Bensalah, S. Alami Younssi, M. Ouammou, A. Gurlo, M. Bekheet, Azo dye adsorption on an industrial waste-transformed hydroxyapatite adsorbent: Kinetics, isotherms, mechanism and regeneration studies; *Journal of Environmental Chemical Engineering* 8(3) (2020) 103807.
- 11- S. Saja, A. Bouazizi, B. Achiou, A. Karim, M. Ouammou, A. Aadane, J. Bennazha, S. Alami Younssi; Fabrication of low-cost ceramic ultrafiltration membrane made from bentonite clay and its application for soluble dyes removal; *Journal of the European Ceramic Society* 40(6) (2020) 2453-2462.
- 12- F. Z. Charik, B. Achiou, A. Belgada, M. Ouammou, S. Alami Younssi; Zeolite Materials in Service of Membrane Technology, Chapter 2020; Nova Science Publishers, Inc. "Zeolites: Advances in Research and Applications", ISBN 978-1-53617-735-0.

**Faculty of Sciences and Techniques Mohammedia-Hassan II University of Casablanca, Morocco  
 Laboratory of Membrane Materials and Environment  
 Director: Saad ALAMI YOUNSSI**

**Teams members of the laboratory:**

1. Membrane Materials and Reactivity
2. Valorization of useful substances and solid waste
3. Analytical Chemistry and Membrane Processes

**Laboratory expertise:**

1. Membranes and membrane processes
2. Development of natural resources
3. Development and characterization of materials and ceramic membranes
4. Analytical Chemistry and Sensors
5. Recovery of solid waste
6. Water treatment and Environmental protection

**26 Doctoral theses defended since the creation of the laboratory in 1998: Doctoral theses defended since 2016**

Theses titles	Authors	Theses advisors	Date of defenses
Natural and Synthetic Apatites as Adsorbents for the Removal of Azo Dyes from Aqueous Solutions	BENSALAH Hiba	ALAMI YOUNSSI Saad	13/12/2019
Elaboration et caractérisation d'une membrane céramique d'ultrafiltration en bentonite déposée sur un support plan à base de perlite marocaine. Application à la filtration des colorants solubles et des effluents industriels	SAJA Souad	OUAMMOU Mohamed	07/12/2019
Electrogravimetric and electrochemical studies on new nanostructured materials based on carbon nanomaterials, conducting polymers and metal nanoparticles: Application for energy storage and conversion	EL MEHDI HALIM	EL RHAZI Mama	30/11/2019
Filtration of saline solutions by gamma alumina ultrafiltration and polyamide nanofiltration membranes. Application to water denitrification and heavy metals removal	BREIDA Majda	ALAMI YOUNSSI Saad	29/06/2019
Préparation et caractérisation de membranes d'ultrafiltration à base de TiO <sub>2</sub> et de nanofiltration à base de ZrO <sub>2</sub> dopé par TiO <sub>2</sub> sur un support céramique de microfiltration en bentonite Marocaine. Application à la filtration des solutions synthétiques et des effluents industriels	BOUAZIZI Abdelmjid	OUAMMOU Mohamed	01/12/2018
Étude de nanocomposites polypyrrole/nanoparticule de carbone par impédance électrochimique et ac-électrogravimétrie : application aux capteurs électrochimiques	OULARBI Larbi	EL RHAZI Mama	29/06/2018
Etude de la performance d'une station d'épuration des effluents du raffinage de pétrole et amélioration des conditions de traitement	OUBRAYME Hasna	BOUHRIA Mohamed	12/05/2018
Elaboration et caractérisation de différents composites Polymère / Bismuth / Zéolite / Liquide ionique : Application à la détection des métaux lourds et des pesticides	SALIH Fatima Ezzahra	EL RHAZI Mama	10/01/2018
Elaboration and characterization of microfiltration and ultrafiltration ceramic membranes based on natural pozzolan	ACHIOU Brahim	OUAMMOU Mohamed	20 /052017
Élaboration et caractérisation de membranes céramiques planes de microfiltration à base d'argiles Marocaines et d'ultrafiltration à base d'oxyde de zirconium	ELOMARI Hanan	OUAMMOU Mohamed	23/12/2017
Elaboration et caractérisation de nanocomposites pour l'oxydation électrocatalytique du méthanol	BASRI Miloud	EL RHAZI Mama	11/11/2017
Valorisation des matériaux lignocellulosiques, des déchets agricoles et des cendres de chaufferies au bois comme adsorbants naturels en milieux aqueux et étude de l'applicabilité du couplage adsorption/filtration membranaire	FAYOUD Nour-elhouda	ALAMI YOUNSSI Saad	31/12/2016

**More than 100 publications indexed since the creation of the laboratory in 1998: Publications since 2017**

- 1- Bouazizi A., M. Breida, A. Karim, B. Achiou, M. Ouammou, J.I. Calvo, A. Aaddane, K. Khiat, S. Alami Younssi, Development of a new TiO<sub>2</sub> ultrafiltration membrane on flat ceramic support made from natural bentonite and micronized phosphate and applied for dye removal, *Ceram. Int.* 43 (2017) 1479–1487.
- 2- Achiou B., H. Elomari, A. Bouazizi, A. Karim, M. Ouammou, A. Albizane, J. Bennazha, S. Alami Younssi, I.E. El Amrani, Manufacturing of tubular ceramic microfiltration membrane based on natural pozzolan for pretreatment of seawater desalination, *Desalination* 419 (2017) 181-187.
- 3- Bensalah H., M. Bekheet, Saad Alami Younssi, Mohamed Ouammou, A. Gurlo, Removal of cationic and anionic textile dyes with Moroccan natural phosphate, *Journal of Environmental Chemical Engineering*, 5(3) (2017) 2189–2199
- 4- Bouazizi A., M. Breida, B. Achiou, M. Ouammou, J.I. Calvo, A. Aaddane, S. Alami Younssi, Removal of dyes by a new nano-TiO<sub>2</sub> ultrafiltration membrane deposited on low-cost support prepared from natural Moroccan bentonite, *Appl. Clay Sci.* 149 (2017) 127–135
- 5- Saja S., A. Bouazizi, B. Achiou, M. Ouammou, A. J. Albizane, Bennazha, S. Alami Younssi, Elaboration and characterization of low-cost ceramic membrane made from natural Moroccan perlite for treatment of industrial waste water. *Journal of Environmental Chemical Engineering*, 6(1), (2018), 451–458.
- 6- Karim A., B. Achiou, A. Bouazizi, A. Aaddane, M. Ouammou, M. Bouziane, J. Bennazha and S. Alami Younssi ; Development of reduced graphene oxide membrane on flat Moroccan ceramic pozzolan support. Application for soluble dyes removal; *Journal of Environmental Chemical Engineering* 6 (2018) 1475-1485.
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#### **Congresses organized since 2014**

- 1- First International Symposium on Nanomaterials and Membrane Science for Health, Water, Energy and Environment – du 11-12 Octobre 2018 – Marrakech.
- 2- International Workshop on « Membrane Technologies for Desalination and Water Treatment : Current State and Research Prospects in Morocco », 16-17 Novembre, 2017, Mohammedia.
- 3- The Third International Symposium on “Analytical Chemistry for a Sustainable Development”- ACSD 2016, 11-12 Mai, 2016 – Marrakech.
- 4- International Workshop on « Nanotechnologies: “Research, Innovation and Economic Challenges » , 28-29 Octobre, 2015, Casablanca.
- 5- International Workshop « Sciences and Membrane Technologies » Renewable energy and water treatment. In collaboration with Unesco Chair Simev and the African Membrane Society (AMS). 15-17 Avril, 2014, Casablanca.

#### **Current research contracts**

- 1-Research project Hassan II Academy of Sciences and Techniques, 2016, ELA5580689, Scientific Institute Rabat, Hassan II University Mohammedia - Casablanca prospects for sustainable development.
- 2- Research project in priority areas of Scientific Research funded by CNSRT: "Development of electrochemical sensors and nanofiltration membranes based on polymer nanocomposites -graphene or metal oxide-graphene. Application to the detection and retention of metal cations ”.
- 3- project for the benefit of CEDocs doctoral study centers funded by the National Center for Scientific and Technical Research - Morocco and the SCAC - French Embassy in Morocco, Desalination of brackish water and seawater by membrane techniques Nanofiltration and reverse osmosis using polymer membranes and prototype graphene membranes.

### **Laboratory of Membrane Materials and Environment**



**Photo of the Scientific Day welcoming new PhD students, January 16, 2019.**



The Moroccan Membrane and Desalination Society (MMDS) is a Moroccan Non-Governmental Organization (NGO) & Non-Profit Organization (NPO), created in May 2005 by group of specialist, researchers, in membranes technologies and desalination, from Universities and industries.

#### MMDS objectives

- Improvement of R&D in the field of water desalination and membrane techniques
- Set up and improvement of knowledge management in the field of the use of membrane techniques at Moroccan and regional levels.
- Create synergy between researchers and industrial users or potential users of the membrane techniques;
- Strengthen cooperation with Moroccan and international organizations and institutions, operating in the field of water and desalination,
- Technical assistance to promote the capacity building in the field of membrane technologies and water treatment sector

#### MMDS organization

- Pole 1 : Research and Development R&D;
- Pole 2 : Interface, Technology Transfer, Expertise;
- Pole 4 : Training and Communication.

#### MMDS's Main scientific activities

- First International Symposium on Nanomaterials and Membrane Science for Health, Water, Energy and Environment - October 11th and 12th, 2018 - Marrakech
- International Workshop on « Nitrates and pesticides in water: problems and treatments », April 5<sup>th</sup>, 2018, Kenitra
- International Workshop on « Membrane Technologies for Desalination and Water Treatment : Current State and Research Prospects in Morocco », November 16<sup>th</sup>, 2017, Mohammedia,
- International Workshop on « Nanotechnologies: "Research, Innovation and Economic Challenges », October 28th-29th, 2015, Casablanca
- International Workshop « Sciences and Membrane Technologies » Renewable energy and water treatment. In collaboration with Unesco Chair Simev and the African Membrane Society (AMS). April 15-17 2014, Casablanca.
- Set up research platform, in March 2014, at Al Anouar High school, Sidi Tayebi Municipality, Province of Kenitra. Morocco : membrane technology connected to photovoltaic and a wind power production system.
- International Confrence on « Desalination and Sustainability » in collaboration with IDA. March 1-2 2012, Casablanca.
- International Workshop in collaboration with STI Veolia, « The water, an industrial challenge », October 7, 2010 Hyatt Hotel, Casablanca.
- Course in collaboration with MEDRC « Desalination of sea and brackish waters by Nanofiltration and Reverse Osmosis. Modelling and simulation process ». February 2-5, 2009. Cerphos, Casablanca.
- International meeting on «The Resources Management of Water in the dry zones ». , April 26-27, 2008. Palais des Congrès – Laayoune, Morocco.
- Scientific day in collaboration with PALL on « Membranes and industrial discharges ». June 26th, 2007, Casablanca.

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