

Words of the president of AMS

The African Membrane Society is the result of discussions initiated in August 2010 in Bamako at a workshop of the Mali Symposium on Applied Sciences. Experts on water and membrane technologies present at the meeting had then expressed the wish to create a continental structure able to meet the following expectations:



- form a critical mass of African experts in the field of membrane filtration, water treatment and renewable energy;
- have a pan-African network where all continental cultures can discuss scientific and technological issues;
- engage close partnerships with global elites in the field of filtration;
- encourage the emergence of AMS as a scientific society; and promote partnership with the industry sector.

AMS virtual network was created in 2011 which comprised about thirty members from West Africa, North Africa and some members in North America. After the launching of a virtual platform, this group has appointed an interim executive body that continued to operate between 2012 and 2014.

AMS was officially created in August 2014 during a second international meeting in Bamako, and is headquartered at the National School of Engineers AB Touré of Bamako. Today, the association staff has doubled (65 members) and the website of the AMS counts more than 2,700 visitors.

AMS advocates for the study and exploitation of filtration processes focused on Water, Health, Energy and Environment.

In the area of water treatment, filtration units have several technological advantages for Africa (modularity and robustness of systems, consistency in water cleanliness, relative ease of use, etc.) and capital and operational costs tend to trend toward those of conventional platforms. The priority and the challenges for the AMS are to stimulate technological appropriation via the formation of a critical mass of experts and dissemination of scientific knowledge.

An encouraging sign of our time is that African States seem to have incorporated the need to mobilize and share priority resources of the continent to address transnational threats posed by armed conflicts, food crises, drought and epidemic risks. AMS welcomes these initiatives and believes that its success is closely tied to active mobilization of African policymakers. We will assuredly seek their support to help the best research centers of the continent sharing their skills with those who may benefit from them. We believe that doctoral students and young African professionals have an essential role to play in the consolidation, or even normalization, of these inter-state exchanges. It is in this light that we maintain close ties with the younger members of the AMS and provide them with various services such as mentoring programs, invitations to meetings of the Board, travel grants, awards for the best scientific contributions, and a section for young talent in the newsletter.

We believe that the development of partnerships in the filtration area outside of Africa is also essential. Our association has close ties with the Chair of the UNESCO-SIMEV (Science & Membranes for the Environment), the European Membrane Society, the European Membrane Institute, the Third World Academy of Science, the *Agence Universitaire de la Francophonie*, and the California Institute of Technology. Their support has encouraged the emergence of AMS; we are very grateful to them. On the other hand, we regularly exchange with the Aseanian Membrane Society and the North American Membrane Society to strengthen academic and industrial partnerships.

Therefore, AMS seeks to respond to major development issues in the African countries by promoting the use of membrane filtration in key areas such as water, health and the environment. In addition to providing

technological and scientific knowledge, it aims at networking all stakeholders, including policy makers, industry and the population according to various ways of disseminating information and consultation (website, newsletters, regular international meetings and symposia, etc.).

Regarding the policymakers of African countries, their mobilization is essential for integrating these concerns into local policies. Strengthening and enhancement of local skills through greater involvement of young PhD students and professionals is also a very important challenge that AMS wants to tackle. Finally, critical mass and visibility provided by the established wide network, participating in funding opportunities of pilot actions, and even more ambitious internationally involved future projects (including participation in competitive international calls).

For short-term goals, here is the list of 2015 and 2016 priorities that AMS has set:

- preparation of the next international meeting of the AMS in Sfax (Tunisia) in spring 2016;
- publication of a thrice-yearly AMS newsletters ;
- publication of an introductory membrane textbook on water treatment by African users;
- updating the AMS website;
- posting a database of African experts on filtration, membrane systems and water management.

This newsletter aims to providing greater visibility to AMS activities (members, resources, projects, etc.), to present current projects on the promotion of filtration processes in Africa, and to integrate contributions of our esteemed partners.

Abdoulaye DOUCOURE

We hope you enjoy reading the first issue!

AMS News

AMS is a scientific association, of public interest, not for profit, not accepting any form of discrimination within it. It is headquartered at the National School of Engineers Abderrahmane Baba Toure in Bamako. The permanence at its headquarter is assured by Professor Arona Coulibaly with whom you can communicate directly by e-mail: aron_a_coulibaly@yahoo.fr

Announcement Section

One of AMS flagship projects in the near future is the publication of a textbook on membrane technologies for undergraduate engineering students. To this end, AMS is calling for contributions from experts in the field of membranes, regardless of nationality, interested in participating to write a chapter of this book to contact one of the editorial board members through the following emails:

Sidy BA (Sidy.Ba@USherbrooke.ca) ;

Alexander ANIM-MENSAH (alexraymonda@yahoo.com) ;

Mady CISSE (benmadycisse@gmail.com) ;

Abdoulaye DOUCOURE (ablodoucoure@hotmail.com).

As part of its mission to promote membrane technologies, AMS will hold its next biennial conference in Tunisia. The event will be organized by Prof. Raja Ben Amar and her team at the University of Sfax, during the spring of 2016. An official announcement will follow soon. Stay tuned!

The North American Membrane Society (NAMS) will hold its 25th annual meeting on membranes from May 30 to June 3, 2015 in Boston, MA, USA. During this scientific conference, AMS will be represented by some of its board members who will give presentations and talk about AMS.

Membrane & Filtration Research in Africa

Competitiveness of membrane technology in water treatment has greatly increased over the last decade. This is in large part due to the efficiency of this treatment process in removing small contaminants that often escape conventional methods, not requiring use of chemicals, and its relatively affordable energy consumption. Given these advantages, membrane technologies are essential in the coming years to meet the demand for ever increasing diverse water needs. Thus, membrane technology dissemination initiatives are underway in Africa despite the fact that the cost of energy remains high in the continent compared to many other parts of the world. Indeed, a successful partnership between the National School of Engineers Abderrahmane Baba Touré (ENI-ABT) in Bamako, the Faculty of Science and Technology (FAST), Energie du Mali (EDM SA: the national energy company in charge of producing and distributing drinking water), PALL France and The Academy of Sciences for the Developing World (TWAS) has enabled a project for the treatment of surface water by a membrane technique. This study was conducted on a Pall microfiltration Aria AX2 unit and aimed to benchmark the efficacy of water treatment between this pilot and the current conventional system. The study was successfully conducted as part of a Master's thesis by Souleymane SOW. The results demonstrated predictable higher performance to reduce turbidity by the membrane technology; more surprisingly, less energy consumption per cubic meter of drinking water produced. The academic partners from ENI-ABT school can provide further insight on this research initiative.



Pall Aria MF/UF unit AX2 Bamako, Mali

Presentation of one of the project partners: ENI-ABT in Bamako

ENI-ABT is an institution of higher education in Mali whose mission is devoted to academic, professional and continuing training of engineers and technicians in the fields of energy, water and environment, civil engineering, geomatic, geology and mining, industry and telecommunications. To fulfill its mission, the school has 4 academic departments and research which are the Departments of Civil Engineering, Industrial Engineering, Geodesy and Geology. Several workshops and laboratories are attached to the 4 departments and provide practical training to high qualified students of ENI-ABT. The school headquarters AMS and is located at:

410, Av. Van Vollenhoven,
BP 242, Bamako, MALI
Tél. : +223 20 22 27 36
Fax : +223 20 21 50 38
www.eni-abt.edu.ml



Images of ENI-ABT

Under AMS spotlight

The vision of AMS is to prepare and train a critical mass of African experts specialized in membrane science, water treatment processes and sustainable technologies in the field of energy. In line with this vision, AMS has initiated, with the material and financial support of its partners, an award program for young talents working in the field of membrane technologies in Africa. This program is designed to encourage these young people in their scientific and technological research on membranes. At the 7th meeting of the Malian Society for Applied Sciences (Mali from August 3-8, 2014), AMS has organized its second international workshop on the topic of "Water, Health and Environment". During this workshop, thanks to the material and financial support of the Department of Computer Science at the California Institute of Technology and the European Society of membrane, AMS has awarded three prizes for the best posters on the basis relevance of the membrane technology, graphics clarity, scientific innovation, logic and critical thinking. The winners of these prizes of € 200 each are: Ahmed HAMMAMI- Laboratory of Materials Science & Environment, Faculty of Sciences of Sfax, **Tunisia**; Tarik ELJADDI - Univ. Hassan II Fac. Science Ain Chock, Casablanca, **Morocco** and Saidou Nourou DIOP - FST, Univ. Cheikh Anta Diop, Dakar, **Senegal**.

April 15-17, 2014, AMS in collaboration with the Moroccan Society Membranes and Desalination and the UNESCO-SIMEV Chair (France) jointly organized an international seminar on "Sustainable Technological Processes for Water Treatment". Several technical sessions were held in the presence of world-renowned experts in water treatment, membrane filtration and renewable energy. A competition was held for the best posters at the Casablanca conference which received material and financial support from the Department of Computer Science at the California Institute of Technology, the Groupe Inter Académique pour le Développement (France) and the European Membrane Society. Five prizes amounting to € 2,000 at 400 € per poster have been awarded to the following authors:

- Nouha TAHRI - Faculty of Sciences of Sfax – **Tunisia** ;
- Mohamad Mustapha DIEME – **Senegal** ;
- Hannane DACH - Fac Sciences FES Techniques - MOROCCO, A. ZDEG of Ibn Tofail University of Kenitra – **Morocco** ;
- A. ZDEG de l'Université d'Ibn Tofail of Kenitra – **MAROC**
- Larbi OULARBI - University of Mohammedia – **Morocco**.

AMS members are proud to award these prizes to young African talents who often work in difficult research conditions and still manage to generate some impressive results through hard work. We invite and encourage others involved in the promotion of membrane technologies to sponsor this award program for young African talents.

Our partner's corner

“The European Membrane Society supports membrane science and technology in Africa”

During the International Conference on Membranes and Membrane Processes (ICOM) in July 2014 in Suzhou, China, it was underlined that membrane science and technology has a global interest today. That may seem a logical remark, but it has not always been the case. Going back in time, to the origins of membrane separations, it was Japan, Europe and the USA who took the lead in organizing membrane activities, bringing researchers and the industry together, discussing about fundamentals and applications of membranes. It was evident that the core of the activities was organized in these parts of the world; these have stimulated progress in development of membrane processes enormously. In the scientific literature, the dominance of the traditional regions was evident in the 1980s and the 1990s. After the turn of the century membranes started conquering other parts of the world as well. The most impressive development has been in China. Starting from a nearly blank sheet, China managed to become in no less than two decades one of the leaders in membrane science and particularly, in membrane applications. The Asian continent organized the membrane network in the Aseanian Membrane Society (AMS), with as strong member countries the traditional Japan, but also Korea, China, and Australia. On the other side of the globe, Latin America found a natural partner in the North American Membrane Society (NAMS). Some of these countries have also seen an impressive progress. Countries like Mexico, Brasil, Argentina and Chile continue to put their mark in the membrane world.



Bart Van der Bruggen,
President de European
Membrane Society

In the Old Europe, the European Membrane Society (EMS) is very enthusiastic about this evolution. Nevertheless, the EMS Council that came in charge in 2013 wanted more than this. Some areas of the world still need to be stimulated to join in with membrane science and technology. We may think of large countries like India or Indonesia, emerging countries like Vietnam, or regions where tremendous investments have been made, such as the Middle-East. From the EMS point of view, however, the interest is in Africa - the continent that is not only geographically near but also in our minds. Europe has always cherished good its relationship with Africa, and this is even more so for scientists. The establishment of the African Membrane Society has attracted special attention from European membranologists, and Africa will have the support from Europe in stimulating membranes in every way: research in universities and knowledge centers, local expertise not only in these universities, but also in active industries, and applications in water and wastewater treatment, environmental protection, industrial production, or recycling. We recognize the enormous potential of filtration processes in Africa, and we strongly believe that it is possible. Even more: it is possible NOW. On the other hand, we also recognize the challenges. Africa is a large continent, in which networking is not evident. Sadly, this is further hampered by local and regional conflicts. North Africa and South Africa have traditionally a strong link with Europe. As a country, South Africa is already quite present in the filed field of membranes, but it remains somewhat out of the global societies. It is easy to see that this is a fantastic opportunity to spread membranes in all of Southern Africa! On the northern side of the continent, in Morocco, Algeria, Tunisia, Egypt, membranes are not unknown either. Once again it was not the lack of interest or expertise that hampered these countries, but interruptions triggered by instability. Today it is vital to come with a positive message of growth, development and stability. Membranes would help with this.

East Africa has a vast potential today, which is still unexplored - but will not remain so. The African network has been initiated in Mali, in West Africa. This is today a new area for membranes; as said, the practical difficulties have to be recognized but the start has been made, and difficulties are there to be overcome. It's ironic that membranes, which have separation functionalities, can serve globally to unite people and countries together in harmony, all with the same objective of a peaceful global society. The EMS strongly supports this, and reaches out to Africa.

Young researchers' corner

Young African scientists admirably contribute to the development of membrane technologies on their continent. We gave the floor to some of these future experts who will carry on the torch of the AMS :

- Dr. Tarik ELJADDI, PhD researcher on membrane processes, polymers and environment in the Interface Laboratory of Interface Materials-Environment (LIME), Department of Chemistry, Faculty of Science Ain Chock University of Hassan II, Casablanca, Morocco ;
- Ms Nouha TAHRI, 4th year student enrolled in PhD program in Chemistry at the Faculty of Sciences of Sfax, Tunisia, under the supervision of Professor Raja Ben Amar ;
- Mr Ahmed Hammami is enrolled in 3rd year of the PhD program in Chemistry at the Faculty of Sciences of Sfax (Tunisia) under the direction of Prof. Raja Ben Amar.

Dr Tarik ELJADDI : The title of my thesis is "Study and quantification of the evolution in performance of different polymeric membranes designed for directed processes aimed at extracting facilitated metal cations". As part of my thesis work, I was hosted as a visiting scientist at the Laboratory of Polymers, Biopolymers and Surfaces (PBS), university of Rouen, France. It is expected that I defend my thesis on March 2015.



To date, I have published 16 articles on the membranes. I participated to numerous scientific events such EUROMEMBRANE 2012 in London, civil matters progress, environmental and materials research (ACEM 14) in South Korea, the first conference on the use of the membrane desalination in Barcelona, Spain, 2014. During these gatherings I performed oral or poster presentations. In addition, I am a reviewer for some journals such as Chemical Engineering Canadian Journal and Journal of Applied Polymer Science.

I am involved in various scientific activities. To this end, I am a member of the European Society of membranes (EMS), Moroccan society membranes and desalination (MSMD) and the African Society of Membranes (AMS).

Currently, I am actively looking for an opportunity of a postdoc on membrane technologies. You can see my publications on my Thomson Reuters space(www.researcherid.com/rid/J-3320-2014) or my account LinkedIn (www.linkedin.com/Tarik_ELJADDI).

Excerpt from the poster rewarded in Casablanca / 15-17 April 2014

Introduction:

In this study, we developed asymmetric membranes based on the PSU / PVP polymers by the phase inversion method and containing **Azithromycine (AZ)** as a carrier in order to achieve the facilitated transport of cadmium ions from acidic solutions. Macroscopic parameters, permeability P and initial flux J_0 related to facilitated transport of these ions were determined. For understanding this process, we have characterized these membranes by various techniques (SEM, angle contact..).

> Membrane Characterization

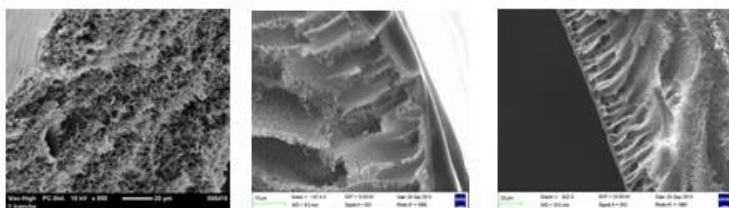


Fig. 1. Micrographs of the cross-sections of membranes
a.PSU alone b.PSU/PVP c.PSU/PVP/AZ

M^{me} Nouha TAHRI : My thesis focuses on the preparation and development of new ceramic membranes based on porosity-controlled carbon filtration and their applications in wastewater treatment and for the purification of industrial phosphoric acid.

The benefits of membrane technology in the field of water treatment are well known: compared to conventional separation techniques (coagulation / sedimentation, sand filtration, activated carbon filtration grain ...), these processes offer the flexibility to eliminate in one step a wide range of pollutants while i) providing disinfection safety via the "physical retention" of microorganisms and pathogens, ii) delivering constant processed water quality and iii) reducing the use of chemicals. Originally used for the production of drinking water, these techniques are now widely used for the treatment of wastewater. The membrane material which ensures the separation can be an organic-based construct or some inorganic polymers. Recently, efforts have been devoted to design economically attractive and efficient membranes. They resulted in a selection of new materials, improved flawless thinner membranes preparation techniques and increased range of applications. But until now, very few studies are initiated for preparing asymmetric carbon/carbon membranes. In this work, we have devised the synthesis of asymmetric microfiltration and ultrafiltration membranes entirely in carbon and tested their application to the treatment of textile effluents at the laboratory scale. Tubular materials are prepared by extruding a plastic paste. The slip casting method is used for depositing a layer on the support. By optimizing the technique used for the deposition of layers, it will be possible to selectively create uniform and defect-free microfiltration, ultrafiltration and nanofiltration layers.

Excerpt from the poster rewarded in Casablanca / 15-17 April 2014

1. Introduction

With the development of global economy, the lack of water resource is becoming an increasingly crucial problem. Nowadays, membrane separation technology has been becoming an important way in the treatment and the recycling of wastewater. Carbon membranes have attracted much attention as an alternative to polymeric membranes given their low cost, high hydrophobicity and a strong chemical and mechanical resistance. Hence, these materials can be utilized for purifying highly corrosive industrial chemical solutions and for processing many types of wastewater streams.

➤ Application to the treatment of textile wastewater

Treatment conditions:

- Transmembrane pressure (TMP) of 7 bar
- Temperature of 25°C.

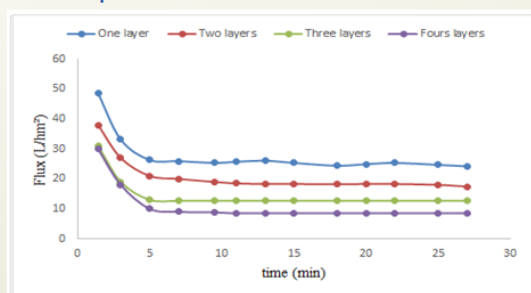


Figure.7. Filtration flux variation versus time

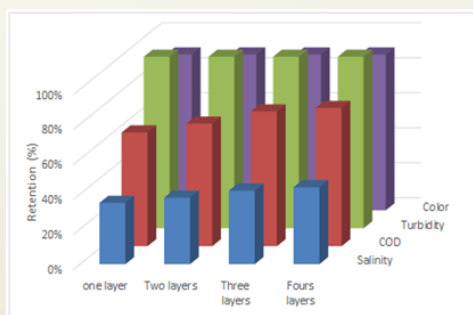


Figure.8. Change in retention properties for different parameters

Mr Ahmed HAMMAMI: My work focuses on treating dye effluents from industrial textile wastewater by using a hybrid process composed of adsorption and ultrafiltration. The goal is to eliminate pollutants, especially color in order to obtain reusable treated wastewater. AO7 dye solutions and dye wastewater are considered.

Two processes are considered:

- separate processes of adsorption/UF (batch mode);
- combined hybrid processes (continuous mode).

The effect of various parameters (temperature, pH, concentration, time, addition of additives) on the performance of both processes will help us choosing the best option.

AMS on the Scientific Press /Topic « Frugal Engineering »

In a recent perspective paper in Science (vol. 434, (6202), 1287-1290), Deb Niemeier et al. (2014) argue that complex technical innovation can be an impediment to sustainable global health improvement, especially in developing countries. (Deb Niemeier et al, Science, vol. 434, (6202), 1287-1290, 2014). To paraphrase the authors: “Strategies and technological tools which have been favorable contributing factors in public health systems of wealthy countries have failed elsewhere mainly because of limited infrastructure and low-resource settings”. Their proposed solutions stress multiple measures centered on a model of frugal design, i.e. one for which any engineering design step must account for a weak local infrastructure. However, we believe that Niemeier’s “Template for success” should have discriminated societal needs that are specific to small communities versus those of large communities confronted with exploding demographics. In Africa for instance, one cannot neglect the technological divide existing between rural communities and the more populated areas that have access to more resource assets. Although, fast-growing cities in developing countries can’t leverage operational infrastructure similar to that of wealthy nations, they still process high quantities of raw materials, generate high waste levels, and import many sophisticated items from rich countries. Hence, let’s not forget that context matters and that terminologies associated with “designs” must be nuanced. Thus, adaptive (or agile) engineering seems more appropriate for the bustling African cities having partial access to clean water and electricity.

D. Niemeier et al. article also contrasted the cellular phone technology – accessible to 6 billion persons around the planet - to the mixed outcome resulting from the adoption of latrine or toilet systems – used by a mere 4.5 billion individuals. Indeed, mobile phone are a success story because service providers have managed to deploy a functional communication infrastructure worldwide and consumers have swiftly embraced the short-term value propositions – user friendliness, internet access for market investment, online banking, weather monitoring etc. However the disposal of portable phones poses a growing environmental challenge specifically in communities lacking any reliable solid waste management system. One should therefore acknowledge that current strategies of consumer electronics technology transfer bear a pressing environmental burden that needs to be addressed.

Last, this article emphasizes some prevalent educational pitfalls that affect many developing countries, including the reliance on outdated (often too theoretical) curricula, the limited teaching practices that don not foster innovation, the underpaid and non-motivated faculty, and the poorly equipped experimental laboratories. Niemeier et al. advocate for curricular reforms enabling “students to become successful practitioners of frugal design from a systems perspective”. Indeed, such educational reforms can yield significant progress but other key learning aspects should not be compromised such as the study of fundamental engineering principles, the exposure to cutting-edge technological knowledge (through visits to and exchanges with top-tier schools) and the effects of socio-economic factors on supply chain sustainability. In fact, this topic warrants a deeper brainstorming on educational advancement, which can’t solely be framed around the model of frugal design.

Abdoulaye DOUCOURE
Alexander ANIM-MENSAH
Sidy BA
Nachida KASBADJI-MERZOUK

“AMS is committed to promote excellence in academic and industrial research on membrane technologies in Africa.”

Director of publications of AMS, editor of the Newsletter: Sidy BA

The list of AMS Board members in this link: http://www.sam-ptf.com/directors_fr.html