AMSIC Newsletter

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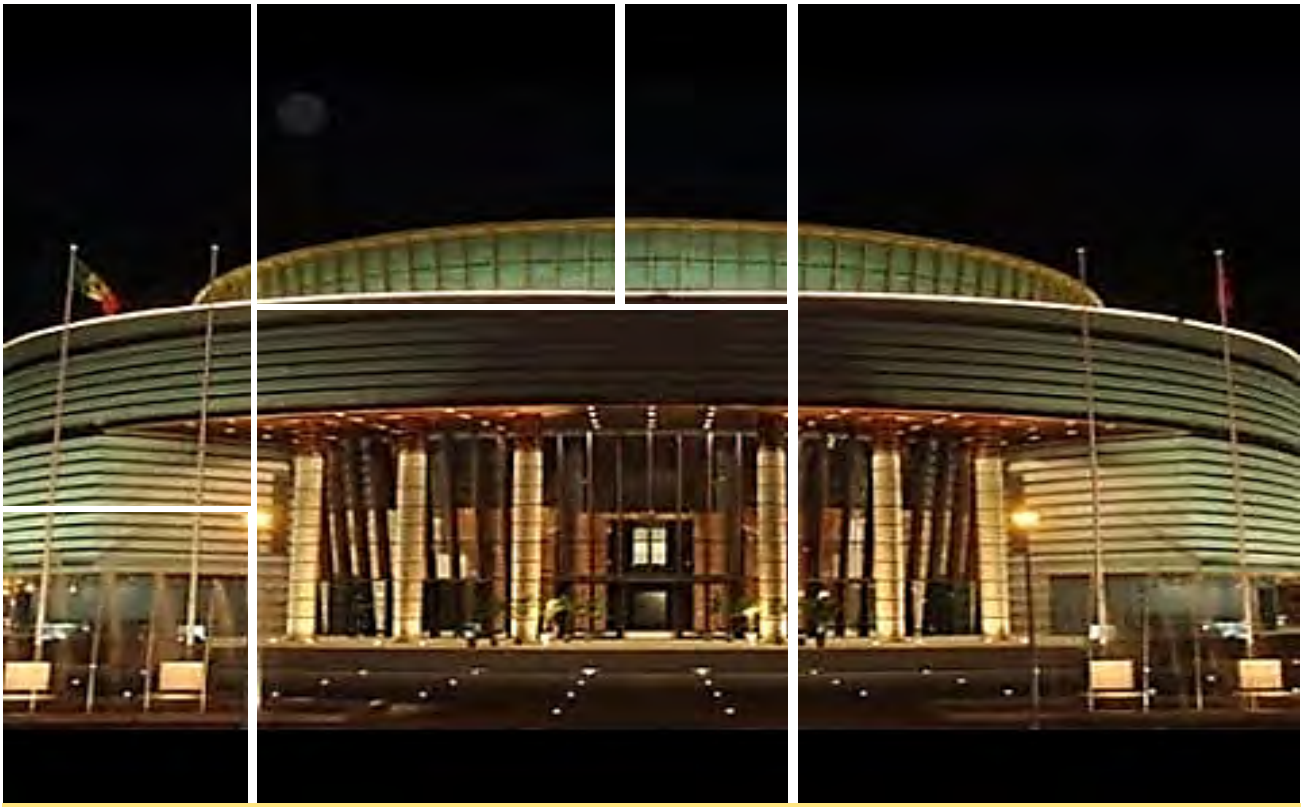


AMSIC invites the world filtration community to Africa

Dakar, Sénégal
November 2 - 5, 2021

Highlights

Editorial

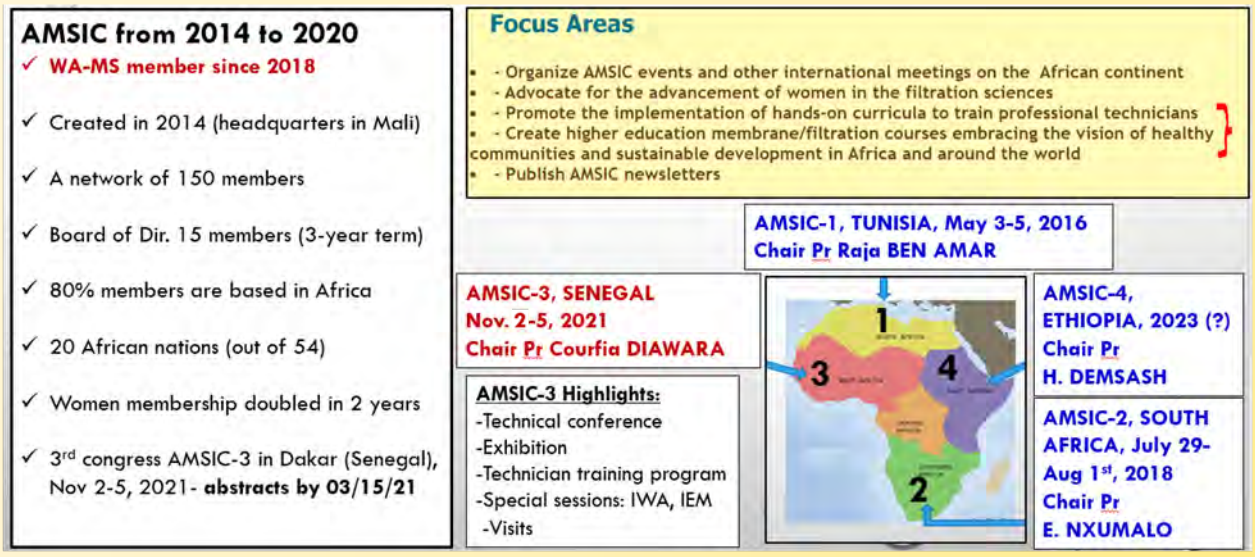
Abdoulaye Doucouré
President of AMSIC

In this last issue of 2020

AMSIC leading voices share their views on a host of topics ranging from

- university research and patent accomplishments (M. Khellouf; R. Chemini),
- post-secondary membrane training in Africa (R. Chemini, A. G. Yihdego),
- student educational journey (S. Chergaoui),
- awarded grant (R. Ben Amar),
- showcasing of a chemistry campus in Johannesburg (H. Richards).

Readers can appreciate other insightful contributions on chemical engineering teach curricula (M. Daramola) and the relevance of intellectual property ownership in the era of the AfCFTA, a trade agreement signed in 2019 by 54 African nations (A. Anim-Mensah).



Main accomplishments in 2020

Despite a challenging year heavily influenced by the COVID-19 pandemic, our network was able to complete some important tasks highlighted as follows:

Scope	Outcome
Enrollment	25% membership growth in 2020. AMSIC counts 150 members spread across 25 countries and 4 continents
***Tutorials**	▪ [1]Samuel S. Coker (AMSIC) – held 02/24/20 ▪ [2]Darren Reynolds and Gillian Clayton, faculty from UWE Bristol (UK) - held 07/23/20 ▪ [3]Raja Ben Amar (AMSIC) – held 10/21/20 ▪ [4]Michael O. Daramola (AMSIC) – held 10/27/20
Higher Education Training	▪ 8 AMSIC faculty volunteering for teaching membrane, filtration courses in 2021 ▪ Partnering with World Association of Membrane Societies for initiating MOOC membrane courses
Apprenticeship Technician Center	• Kick-off in Dakar (AMSIC-3) in collaboration with IEM, UNESCO-SIMEV chair (Montpellier, France)
Communication & visibility	▪ Biannual newsletter (issues #9, #10 in 2020) ▪ Abdoulaye Doucouré (AMSIC) Presented at ICOM during WA-MS session- held 12/09/20

*Tutorial events organized or promoted by AMSIC. Speaker's topic as follows:
1-Depth filtration for blood transfusion safety and patient protection: potential use in Africa
2-Mobile water treatment systems using electrochemically activated solution and UF for clean water production
3-Water-Energy nexus in Middle East North Africa region, on October 15, 21, 2020. AMSIC member Cheima Fersi from INRAP, Tunisia, was a co-organizer
4-Sustainabe chemical engineering practices as a catalyst to realize SDG's, a Professorial Inaugural Lecture organized by University of Pretoria, South Africa

Projects in the pipeline for 2021:

To establish effective membrane and filtration development programs issues relative to collaborative engagement, active publishing and increased professional visibility must be prioritized. For the coming year, our network will concentrate on delivering some tangible outcomes and assess their impact, which includes

- Creation of a member's profile database
- Inventory of scientific publications and patent filing
- Tracking of transnational research collaborations in Africa
- Tracking of transcontinental research collaborations
- Emerging Academia-Industry interactions

Let us hope that the global health environment will be safe enough to hold AMSIC-3 (November 2-5), in Dakar, Sénégal and give us an opportunity to meet. The end of 2021 will lead to an exciting era with a new AMSIC presidency and the preparation of our 4th congress to be held in Addis Ababa, Ethiopia for the first time.

Developing membrane and filtration online courses for post-secondary students in Africa

AMSIC members Rachida Chemini, Abaynesh G. Yihdego and Abdoulaye Doucouré are working diligently to organize online training modules that students in Africa can benefit from. The proposed curricula comprise undergraduate and graduate training modules and target fundamental and applied knowledge relevant to membrane, filtration and energy sciences and technologies. The vision is to create and consolidate expertise in these disciplines by teaching trainees across the Continent. This effort is in its inception phase and is conducted on a voluntary basis.

Who should attend?

Seven AMSIC members have just signed up as trainees for these modules. The organizers would like to establish a core group of students (ideally 20 graduate level students) eager to attend all remote training that will be available. Trainees are selected among individuals originating from Africa, but can be higher education students, early career professionals or candidates new to the membrane world. People with a passion for teaching and research are encouraged to participate. Furthermore, some campuses in Africa may want to enroll full classes of students. AMSIC is open to consider this option although a few administrative steps may need to be completed before starting the training program.

Choosing the instructors

AMSIC expertise – Dozens of members that are highly experienced in teaching and research have already volunteered. Discussions are underway to organize the training agenda.

World Association Membrane Societies (WA-MS): WA-MS will roll out its online educational initiative with few faculty starting their assignments in 2021. They are aware of AMSIC educational goals and are eager to assist. For AMSIC students, it will be a great opportunity to learn from influential professors.

Testing and certificates

Trainees attending AMSIC or WA-MS courses are expected to demonstrate some proficiency in the membrane sciences. The organizers intend to work with the instructors to deliver signed letters from AMSIC/WA-MS experts acknowledging that a candidate successfully passed a specific class. They will work with academic institutions (from teachers/students) and attempt to get the training module(s) validated. Everyone will learn as we go!

AMSIC Board hopes that this information will motivate more candidates to participate in these courses and is thankful to all instructors and WA-MS partners who are willing to assist.

5 Announcements

Doctoral thesis defense under the supervision of Pr. Rachida CHEMINI

Prof Rachida Chemini
AMSIC Director of Communication

Faculty of Mechanical and Process Engineering

Laboratory of Theoretical and Applied Fluid Mechanics

University of Sciences and Technology Houari Boumediene, in Algiers, Algeria

Ms. Meryem KHELLOUF successfully defended a Doctoral Thesis under the supervision of Pr. Rachida CHEMINI on June 23, 2020 at the Faculty of Mechanical Engineering and Engineering Processes of University of Sciences and Technology Houari Boumediene (USTHB) in Algiers (Algeria). The thesis is entitled:

OPTIMIZATION OF HYBRID PROCESS FOR TREATMENT OF POLLUTED WATER. APPLICATION TO HYDROCARBONS AND DYES.

Abstract:

The objective of this thesis is to optimize a process applicable in the treatment of two aqueous textile and petroleum industrial effluents. The choice of physicochemical treatment stages is made on the basis of the nature of the effluents, which are difficult to biodegrade. The methods are coagulation-flocculation, adsorption on activated carbon and ultrafiltration on inorganic membranes. Treatment materials for adsorption and ultrafiltration are synthesized from waste cones of cypress and local clay and sand that are less expensive and abundant in nature. This work describes in detail the optimization of the synthesis of materials and their characterizations, as well as the optimization by experimental plans of the operating conditions in each treatment sequence. The depollution efficiency of the two effluents by the optimal process is assessed by determining the reduction rates of the pollution indicators. Chemical oxygen demand is reduced by 88.1% of its initial value in textile effluent and 85.9% in petroleum effluent. The turbidity and the MES of the two effluents are reduced by up to 99.8%.

Keywords: hybrid process; coagulation-flocculation; adsorption; activated carbon; ultrafiltration; inorganic membrane.

SCIENTIFIC PRODUCTION

Patent

Meryem Khellouf, Rachida Chemini, Djamel Zeriri, Mohamed Khodja. Hybrid process for industrial wastewater treatment. Algerian National Industrial Property Institute (INAPI), N° 180574, November 2018.

Chapter book

Meryem Khellouf, Rachida Chemini. Adsorptive textile wastewater treatment. In book: Treatment of industrial discharges loaded with dyes and surfactant. Publisher: Scholars' Press, August 2020
https://www.morebooks.shop/bookprice_offer_b2ff0350d1a85d92b08ace3e1769412490cd7d31

Publications

1. Meryem Khellouf, Rachida Chemini, Zineb Salem, Mohamed Khodja, Djamel Zeriri, Amane Jada. A new activated carbon prepared from cypress cones and its application in the COD reduction and colour removal from industrial textile effluent. Environment, Development and Sustainability, 2020**.** **https://doi.org/10.1007/s10668-020-00944-2**
   ISSN 2437-1114. e- ISSN 2478-0030.

2. Meryem Khellouf, Rachida Chemini, Zineb Salem, Mohamed Khodja, Djamel Zeriri Parametric study of COD reduction from textile processing wastewater using adsorption on cypress cone based activated carbon: An analysis of a Doehlert response surface design. Arabian Journal for Science and Engineering, 44:12 (2019) 10079-10086, **https://doi.org/10.1007/s13369-019-04188-9.**

3. M. Khellouf, R. Chemini, Z. Salem, M. Khodja, D. Zeriri. Optimization of preparation and application of activated carbon derived from cypress cones. Algerian Journal of Environment Science and Technology, 5:1 (2019) 841-851.
   ISSN 2437-1114. e- ISSN 2478-0030.

Communications

1. Meryem Khellouf**,** Rachida Chemini**,** Zineb Salem. Simulation of wastewater treatment plants in the petroleum industry. 2nd African Membrane Society International Congress, Johannesburg (South Africa), 29 July – 1 August 2018.

2. Meryem Khellouf**,** Rachida Chemini**,** Zineb Salem. Parametric study of the adsorption of industrial textile wastewater. 3rd International Conference on Large African River Bassins Hydrology, Algiers (Algeria), 6-8 May 2018.

3. Meryem Khellouf, Rachida Chemini, Zineb Salem, Djamel Zeriri, Mohamed Khodja. Modelization of adsorption using surface response design applied to industrial textile wastewater. International symposium on materials chemistry. Boumerdes (Algeria), 19-21 March 2018, **ISBN 978-9931-9090-5-3.**

4. Meryem Khellouf, Rachida Chemini, Zineb Salem, Djamel Zeriri, Mohamed Khodja. Treatment of industrial textile effluents using coagulation flocculation and adsorption. 6th Maghreb Conference on Desalination and Water Treatment "CMTDE2017", Hammamet (Tunisia), 17-20 December 2017.

5. Meryem Khellouf, Rachida Chemini, Zineb Salem, Djamel Zeriri, Mohamed Khodja. Simulation of pretreatment industrial plant for textile wastewater. 6th Maghreb Conference on Desalination and Water Treatment "CMTDE2017", Hammamet, Tunisia 17-20 December 2017.

6. Meryem Khellouf, Rachida Chemini, Zineb Salem, Djamel Zeriri, Mohamed Khodja. Synthesis of activated carbon prepared from agricultural waste. 3rd International Symposium on Materials and Sustainable Development "ISMSD2017", Boumerdes (Algeria), 7-8 November 2017, **ISBN 978-9931-9432-0.**

Events by Raja Ben Amar

Prof Raja Ben Amar
AMSIC Vice President

Chemistry Department

Faculty of Sciences of Sfax, Tunisia

Our project: PRIMA proposal "TRUST" (Management of industrial treated wastewater reuse as mitigation measures to water scarcity in climate change context in two Mediterranean regions) under SECTION 1 2020 MANAGEMENT OF WATER, has been selected for funding. This project is coordinated by the university of Calabria (Pr. Sudip Chakraborty, member of AMSIC). Six countries participate to this project: Turkey, Spain, France, Italy, Tunisia, and Algeria, besides three textile and pharmaceutical Companies. The total budget allocated is EUR 1985.000.00, over a three-year period.

Collaboration University/Industry

The Sfax university has just realized the study and dimensioning for a treatment plant of water emitted by SOPAL company whose activities lie in the surface treatment of the shaped objects.

This plant is based on ultrafiltration with an installed membrane surface of 5 m^2 using a ceramic membrane system. The treated water will be reutilized in the company's activities.

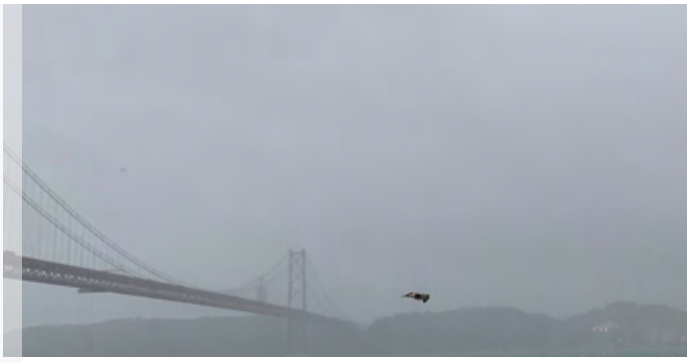
In addition, many actions were taken with companies of textile industry for the treatment and reuse of water effluents. Treatment systems based on membrane technology were installed for the desalination and water purification.

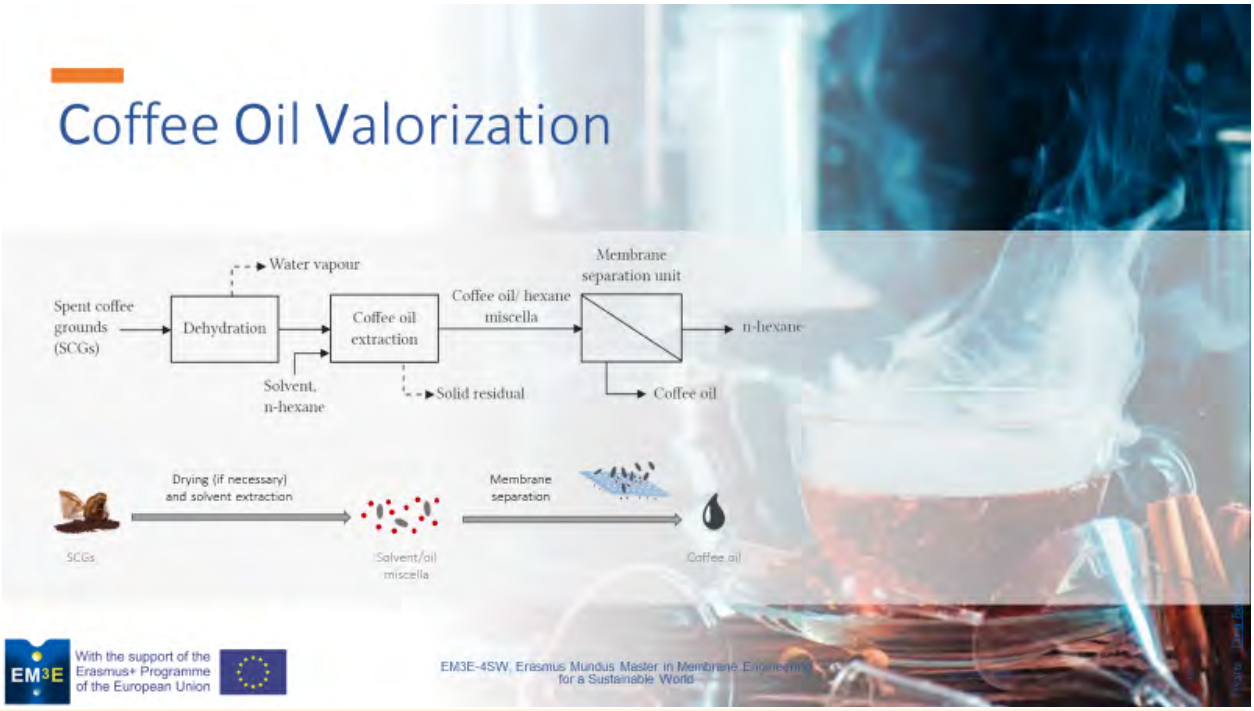
AMSIC Young Talent

Sara CHERGAOUI joined AMSIC family this year seeking interaction with folks in the field of membranes; descending from Morocco, she naturally had curiosity and interest to learn more about the membrane research activity and education in Africa. She started her PhD this late October at UCLouvain in Belgium where she investigates the impact of membrane characteristics on enzyme reactivity and co-crystallization, with the guidance of the wonderful professor Patricia Luis Alconero. She finds her research group members kind and enthusiastic, she cannot wait till she gets results to share with the membrane hub.

Few months earlier, her two-year master's program came to an end. Erasmus Mundus master in membrane engineering for a sustainable world was a delicate beauty. She got the chance to study at 5 universities in 4 European countries: university of Montpellier, university Paul Sabatier, university of chemistry and technology of Prague, University Nova de Lisboa in Portugal and KU Leuven in Belgium. With this program she grew further gratitude for nomadic education. Travelling increases the pace of learning and shapes a global sense of belonging. It became further apparent to her that we live to serve and that her education/ research is important to pave her way to serve her community by solving problems or helping to understand a phenomenon better.

She is grateful to this opportunity that introduced her to membranes and most of all the love of membranes. She received courses and research training from professors she respects dearly, and cherish their presence, character, their sense of ethics and generous advice. France was the step where fundamental courses were taught, classic fundamentals that any engineer or researcher is supposed to be aware of; notably, transport phenomena, safety and sustainability, thermodynamics, chemical kinetics, separation processes, etc. Prague was more about process design and membrane technology itself and that is where she was hooked to the beauty of modelling. Finally, before she starts her master's thesis, she spent a third semester in Lisbon where engineering design, and membrane applications in food and biotechnology were highlighted.





As a coffee lover, Sara chose to work on spent coffee ground valorization for her six-month master thesis project. She was honored and happy to work with professor Bart Van der Bruggen and professor Svetlozar Velizarov to put this idea into a concrete research project. The Covid situation did not make it easy for her to conduct experimental at the time, but she found in mathematical modelling a refuge that allowed for discussing the possibility to use membrane technology for the separation of organic solvent and coffee oil; a valuable product that has multiple applications particularly in cosmetic industry.

The master's degree program was not Sara's first experience overseas. She spent her sixth semester of her bachelor's at Virginia Tech in the US. That is where she first fell in love with the experience of seeking knowledge while travelling. It is overwhelming, challenging, sad at times, but incredibly rewarding, eye opening, and most of all full of surprises that boosts motivation. Motivation to reach out to the scientific community, learn deeper until it is time to develop concepts, experiment, and share. For this, Sara is grateful to her home university, Al Akhawayn university in Morocco for making this possible by offering her the full merit-based scholarship to pursue her studies as such a prestigious university. A reward for that seemed like it came effortlessly at the time, but in fact it was a result of her love for excellence throughout her pre-university education and the wonderful support of her family, whom she loves unimaginably.

Sara is undoubtedly thankful to family, friends, professors, authors of different books and articles, women scientists who paved the way for others to follow. She hopes to be the scientist that brings some joy to the planet, and the professor that inspired students to seek science.

Knowledge Structure and Nature of Curriculum in Chemical Engineering Education and Training in the Era of knowledge Economy

Prof Michael Daramola

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Faculty of Engineering, Built Environment and Information Technology, University of Pretoria, Hatfield 0028, Pretoria, South Africa

Training of young embryonic chemical engineers through chemical engineering education and training requires a sustainable curriculum that will enable them to have refection-in-action and reflection-on-action during the course of the training. A curriculum that will develop in the engineers-in-the-making the critical thinking and creative skills is required to become professionals in the field. Thus, the outcomes-based education (OBE) described by Roberts (Roberts, 2015) could facilitate the development of sustainable curriculum that would enhance transformative learning in chemical engineering education and training. Transformative learning would stimulate the development of the required knowledge and skills for the graduate engineers. According to Roberts (2015), OBE is based on a rational framework that focuses on the expectations from learning system and how to actualize these expectations. In addition, ability to produce competent chemical engineers equipped with the required skills to provide solutions to the societal problems is tied to the availability of functional curriculum in chemical engineering education and training.

Curriculum in engineering education could be perceived as a medium in teaching and learning by which the process of transfer and acquisition of chemical engineering concepts is ensured. Thus, chemical engineering education curriculum, which will provide the embryonic chemical engineers the necessary training, and equip them for the uncertainties in the world, should be developed and implemented (Walkington, 2002). In the current knowledge economy, re-structuring and re-adjustment of the existing curriculum in chemical engineering education and training is inevitable to provide the learners with the critical, creative and entrepreneurship skills required to excel in the world. Thus, several modifications are being initiated and proposed by various nations to ensure that chemical engineering curriculum evolves with time. Achieving the expected transformation in the chemical engineering curriculum depends strongly, amongst other factors, on the knowledge structure, the nature of the curriculum in the field and how the curriculum has been shaped by the knowledge structure in the field. In chemical

engineering education and training, teachers transfer knowledge to learners to help the learners cultivate or build critical thinking skills, through the understanding and application of various chemical engineering concepts. Therefore, this piece aims at describing knowledge structure in curriculum development and highlighting its effect on chemical engineering education and training.

According to Bernstein, the concept of "knowledge structures" showcases how the structures of educational knowledge encompass everything from societal structure through institutional organization to individual identity and consciousness (Bernstein, 1999). In addition, it is very important to understand and know the principles that govern fields with different knowledge structures and also understand the similarity and difference between intellectual fields and educational fields. In the intellectual fields, Bernstein identified two different structures namely the "knowledge structures" and the "knower structures". According to Bernstein (Bernstein, 1999), "knowledge structures" and the "knower structures" provide an in-depth understanding of our social-cultural practices and for every "knowledge structure" there is always a "knower structure". Furthermore, within the knowledge structure "horizontal discourse" and "vertical discourse" exist. The "vertical discourse" refers to the scholarly knowledge acquires from the education system and the "horizontal discourse" refers to the "everyday or commonsense" knowledge that is acquired from experience through informal education. In chemical engineering education and training, the development of learners into skillful graduate engineers is not based only on the scholarly knowledge; "everyday" knowledge plays a crucial role as well.

For example, Industrial Training (IT) is made as an integral part of the curriculum for chemical engineering education and training to align the "vertical discourse" with the "horizontal discourse" in the training of young chemical engineers. Industrial training (IT) creates an opportunity for students to blend theoretical knowledge acquired via the "vertical discourse" within the education system (e.g. classroom or laboratory) with practical hands-on application of knowledge obtained via the "horizontal discourse" approach. While chemical engineering education and training via the "vertical discourse" equips the learners only with the potential to do all several or some jobs in the chemical engineering, the training via the "horizontal discourse" provides the learners hands-on experience and good sense of judgement that give the learners competencies required to be successful in the present knowledge economy society.

Unlike other fields like humanity and social sciences, "vertical discourse" and "horizontal discourse" of knowledge in chemical engineering education and training are harmoniously integrated, giving the knowledge structure its hierarchical structure that fits perfectly with the description of knowledge structure in science by Bernstein (Bernstein, 1999). For example, different concepts in engineering education are well formulated and integrated towards producing a unique goal: the goal of producing an engineer that is equipped with necessary skills and know-hows to provide holistic solutions to societal problems.

As described by Bernstein, pedagogic device embodies a set of rules and procedure that serve as relay through which knowledge is transformed into pedagogic communication (Bernstein, 2000). The pedagogic communication is considered a platform to transmit and acquire knowledge. Three rules mentioned by the author are distributive, re-contextualizing and evaluative (Singh, 2002) and these rules are hierarchically

related. In addition, Bernstein discussed three main fields of pedagogic device that are hierarchically related. These fields are: production of knowledge, re-contextualization of knowledge and reproduction of knowledge. The production of knowledge occurs at the institution of higher learning, re-contextualization of knowledge is undertaken at the departments/ministries of education, and reproduction of knowledge occurs in primary, secondary and tertiary education.

In an educational system, produced knowledge via production of knowledge comprises disciplinary knowledge developed in scientific communities, literary and artistic organization (Castells, 2000). Field of re-contextualization produces sub-fields specialized to levels of the educational system, curricula, and groups of students, and enables to distinguish between agencies of pedagogic production of knowledge. It is considered as a link between knowledge production and knowledge reproduction. On the other hand, reproduction of knowledge considers institutions as a platform where the knowledge from production of knowledge within the re-contextualization of knowledge is transformed and where the translation of the pedagogised knowledge by teachers and students occurs (Bernstein, 2000). The concept of pedagogic device discussed by Bernstein is also applicable in chemical engineering education and training. The curriculum in chemical engineering is construed is a way that contextualization of the content is always enforced and controlled by the exit-level outcomes set and monitored by quality control and assurance bodies such as the South African Department of Higher Education and Training and the Engineering Council of South Africa (ECSA).

In spite of the application of the useful models and theories of Bernstein in the development of curricula in educational system, as depicted in chemical engineering curriculum, the exponential growth in volume and complexity of knowledge and knowledge-related industries has been identified as a great challenge in the system. For example, the advent of new set of knowledge in chemical engineering has made the existing chemical engineering curriculum in higher institutions obsolete. Thus, the present economy driven by knowledge requires sustainable engineering curriculum that could evolve with time to meet up with the growing uncertainty and complexity of everyday life. As much as the application of the pedagogic device could be a promising theory, in-depth understanding and evaluation of the theory via empirical approach might be necessary.

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Some Basics on Intellectual Property (IP) to Position Africans to Tap AfCFTA IP Opportunities

Dr Alexander Anim-Mensah
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Intellectual Property (IP) has several benefits, and it is important for Africans to have an idea because it is one of the Phase II negotiations establishing the African Continental Free Trade Agreement (AfCFTA). Therefore, it provides an avenue to be knowledgeable to seize the opportunities and/or manage any risk.

Some of the issues facing African inventors/creators, innovators, and entrepreneurs in the IP space include lack of education and/or awareness, hence, lack of knowledge; IP laws not very enforceable, hence, benefits does not materialize and does not drive interests; the multi-IP systems across Africa lack of harmonization; lack of robust structure and supporting institutions, fewer people to help through the process; cost and unaffordability.

In the subsequent paragraphs, I will share some basics as well as some importance of IPs and how adopting them properly could work to one's advantage including securing ideas into businesses, positioning businesses competitively and in the long run supporting to drive innovations to grow more industries across Africa.

As many Africans know of patents, patents in addition with others fall under the broad name IP. The World Intellectual Property Organization (WIPO) refers to IP as "*creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce*". Also, WIPO cites that "*IP is protected in law by, for example, Patents, Copyright & Trademarks, which enable people to earn recognition or financial benefit from what they invent or create*". WIPO goes on to include Trade Secret, Industrial Designs, and Geographical indication as types of IP. Moreover, WIPO goes on to add that "*by striking the right balance between the interests of innovators and the wider public interest, the IP system aims to foster an environment in which creativity and innovation can flourish"*.

In my view, patents, copyright, trademarks, and trade secret are known across Africa, however, the details may not be very well-known or understood generally by a greater number of Africans. In basic terms, patents protect inventions such as function or ornamental features whereas copyright protects authorship such as literary works (i.e., book, novel, poems, plays, newspaper articles, etc.); movies, music, choreography; work of arts (i.e., sculpture, paintings, drawings, films, photographs, etc.), technical drawings, maps, computer programs, databases, advertisement, architecture, etc. Trademark like service mark protects brands. Trademark identifies the sources of goods or products and

distinguishes the different sources. It is a brand for goods and products and includes color, taste, or smell while service mark is a brand for services for services and identifies sources of services like landscaping or accounting services. Trade secrets protect valuable information such as a secret recipe, manufacturing processes, technology, product design, marketing strategy, pricing info, information etc. Note that trade secrets when in the wrong hands could be sold or licensed to competitors, hence, taking away one's competitive advantage. This is the reason why one should take the necessary measure to secure trade secrets.

WIPO defines a patent as "an exclusive right granted for an invention, which is a product or a process that provides, in general, a new way of doing something, or offers a new technical solution to a problem. To get a patent, technical information about the invention must be disclosed to the public in a patent application". Comparatively, patents are the strongest forms of Intellectual Property (IP). They are short lived, most expensive to apply, hard to get and make the most money. Patent has four (4) common types namely utility patent, design patent, plant patent and utility model also known as innovation patent, minor patent, or petty patent. In my view, both utility and design patents are the commonest of the four (4). Also, utility patent is the most beneficial, prevalent, makes the most money; cost the most money and efforts to apply and harder to get compare with the rest of the patents.

Specifically, utility patent protects functions and not expression, however, design patent protects expression or appearance, ornamental, or work of art of a functional or manufactured item like a car design. Plants patent protects new plants that cannot replicate or self-replicate while utility model patent also known as innovation patent, minor patent or petty patents protects minor functional inventions that does not meet the patentability requirements of utility patents and normally issued in EU and China. Both utility and plant patents when granted protect an invention for 20 years while design patents about 15 years. Copyright last for a life span plus 70 years while Trademark is potentially indefinite, however, limited by use.

In my view, a good way generally to secure IPs that requires filing is to begin by searching to ensure IP does not already exist either expired (public knowledge) or unexpired (i.e., owned and in-force) before any provisional application and/or non-provisional application. The provisional can be skipped if not needed or not part of the process.

A search is important since a good initial search could avoid myriads of issues during the securing journey. However, there are different levels of search, from light which may be free using the internet to medium through to deep using online software or contracting someone which comes at a cost dependent on the extent or depth of search. A good search is necessary to prevent future infringement and/or to ascertain an IP in question is original to prevent future consequences which could come at a huge cost including time and energy wastes.

For utility and plant patents one must justify the invention is novel, useful, and non-obvious while for a design patent one must justify the invention is novel, useful, and ornamental before filing. Steps in

acquiring a utility, plant or design patent include filing for a provisional patent to secure inventions in the application process with a 12-month grace period pending applying for actual or non-provisional patent and navigation the patent review and appeal process which could last on average for 2 years and then possibly go to court anytime in the process because of patent rejection. The Although provisional patent application could be skipped; however, people it is still putting being prepared with details of the invention use that in order to secure the priority date for the invention on priority date because of the first to file requirement. Note that one can still go to court even after a patent has been granted as part of keeping a patent either to challenge or ward off infringers.

WIPO states for information to qualify as trade secrets it must be “commercially valuable because it is secret; be known only to a limited group of persons and be subject to reasonable steps taken by the rightful holder of the information to keep it secret, including the use of confidential agreements for business partners and employees”. WIPO then adds that “the unauthorized acquisition, use or disclosure of such secret information in a manner contrary to honest commercial practices by other is regarded as an unfair practice and a violation of the trade secret protection”.

The above information suggests that one must make a thorough evaluation to determine the value of an IP especially patents before investing time, energy, and money for the journey. Moreover, it will be good to ensure an IP is strong to prevent being circumvented.

Many methods exist for evaluating IPs. Marsh suggests the following 3 methods for evaluation, namely IPs: cost-based, market-based and income-based. Other with other considerations including include qualitative and quantitative characterization of an IP, earning capacity and profitability relating to an IP; legal rights, restrictions, competition, barrier to entry and risks associated with an IP; and historical growth and prospect for the future.

Cost-based compares the cost to create the asset in the past to the cost to recreate at the current rate; market -based compares market transaction of similar asset for value determination, while the income-based compares income stream associated with an IP in the past and future earnings. Also, one can look at what problem an IP is addressing, the problem is widespread, if it is pressing or not, the need, willingness for people to pay for the IP solution or if it is a differentiator to position one’s business competitively, is there a substitute to the IP already existing, how effective, and may more.

It is worth to point out that not everything could be secured by an IP. For patents, abstract ideas and concepts, natural phenomena, discovery of something in nature among others cannot be patented. An idea or concepts need to be reduced to implementation before it can be patented.

Some of the advantages of IPs especially for patents include, providing patent owner (s) the right to only to produce, license, share, sell, etc. for some limited time over covering jurisdiction (s) creating temporary monopolies; promoting and encouraging useful products, IP published in the public domain, preventing counterfeit products on the market and overall driving innovation. Some disadvantages of IP include cost to society, less competition during when an IP specially patent is active, high prices that could harm consumers and may discourage business innovation to name a few.

Given the numerous benefits associated with IPs including generally driving economic growth and job creation, businesses who that adopts IP grow better on income and employment comparatively. hence, Therefore, societies will benefit more if there is an increase in adoption. There will be as new and more innovative products and services becomes available, the prevalence of will counterfeit and pirated goods on the market will dims. This means a broader understanding of IP is necessary for African inventors/creators, innovators, and entrepreneurs to effectively protect and harness valuable intellectual assets thus generate opportunities for employment, wealth creation and economic growth.

The above suggest that while there are many opportunities in well pursuing Intellectual Property (IP) IP across Africa, however, there are many challenges too. Nevertheless, the benefits are worth the efforts and this may justify why AfCFTA is pursuing IP to drive innovation, competitiveness, among others to support developing Africa while addressing some of the pressing issues.

In my view, anybody can invent or create, innovate, or become an entrepreneur by solving some of the problems around you or in the world in entirely new beneficial and lasting ways and/or improving on the existing solutions to make life better for yourself and everyone. The opportunities are many and it is important worth that one to pays close attention for the solutions are closer to you than you know. Follow appropriate guideline, procedures and consult appropriate persons or agencies to secure your IPs. Seize the opportunities.

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I am Heidi Richards, currently a Senior Lecturer in the School of Chemistry and School of Animal, Plant and Environmental Sciences at the University of the Witwatersrand (WITS) in Johannesburg, South Africa. Prior to my PhD study which commenced in 2009, I was employed full-time in the municipal water sector for a period of 12 years and this was where my passion for water grew and developed over time. My years of experience in wastewater treatment positioned me favorably at WITS, as I am able to teach in various disciplines and was therefore appointed by 2 departments, something that is not very common.

My interest in membrane technology started in 1997 when I started my MSc at the University of Stellenbosch. At the time, membrane research in South Africa was relatively new and I was fortunate to have one of the pioneers of membrane science in the country as my supervisor. My first project involving membranes was assessing the application of polysulfone ultrafiltration membranes in treatment of abattoir effluent. During this study, various pretreatment methods of the membrane and the effluent were considered, and fractionation of the lipids found in abattoir wastewater was done.

Ten years later when I started my PhD, the era of nanotechnology had arrived, and this opened the door to developing nanocomposite materials for various applications. Having worked with polysulfone before and being familiar with its application in wastewater treatment, I focused on developing novel Ni and Co nanocomposite polysulfone membranes for application in wastewater treatment and then characterizing them using electrochemical techniques. I published a review paper on polymer nanocomposites as part of my study (Richards et al, 2012).

An area of research that I have ventured into since joining academia, is the development and application of polymer inclusion membranes (PIM's). The most commonly used base-polymers in the synthesis of PIMs include poly (vinyl chloride) (PVC) and cellulose triacetate; however, they have a number of drawbacks. Polysulfone had not been looked at as an alternative base polymer before, and we have managed to successfully synthesize a polysulfone-based PIM that is able to facilitate transmembrane transport of Cr(VI) and can thus be applied as a passive sampling tool in water. Further research in this area is focusing on the modification of the membrane surface to be target specific and also looking into "greener" solvents for membrane preparation.

Currently I am supervising 7 postgraduate students in Chemistry, 4 PhD and 3 MSc and have graduated 1 PhD and 4 MSc students since 2017. My interest and experience in the water sector has led to me gravitating to research projects that aim to innovate and add value to communities and the broader society, rather than doing fundamental research. To this end, one of our PIM research projects is currently being funded by the Water Research Commission to upscale the technology and it has also very recently clinched 3rd prize in the GAP Innovation Competition hosted by the Innovation Hub (Gauteng, South Africa). I also have published 11 peer-reviewed manuscripts and 1 book chapter.

In order to facilitate multi-disciplinary research in water at WITS, the Centre in Water Research and Development (CiWARD) was established in 2016. I am currently the deputy-director of CiWARD and as such would welcome any proposals for collaboration on projects both locally and internationally. Our team includes researchers from various disciplines that include Engineering, Geography, Mathematics, Social Science and Psychology. Our capacity to work in a number of areas is therefore substantial and should you want to make contact, please drop me an email at **heidi.richards@wits.ac.za** and check out our **website https://www.wits.ac.za/ciward/** for more information.

Research Capabilities:

Membrane synthesis – using evaporation and phase inversion

Characterization – Microscopic: SEM, AFM, TEM

Other: BET, FTIR, RAMAN, TGA

Analytical: ICP-MS, ICP-OES, HLPC-MS, GC-MS, IC, CHNS – analysis, VA

Computer modelling software: JESS, Geochem. Workbench, GIS, PHREEQC, SolEQ, MinteQ, Teach Me, StatGraph, Statistica, S Plus, MatLab

Recent Publications:

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