



AMSIC Newsletter

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

Editorial notes



Edward Nxumalo

Associate Professor

University of South Africa

The 2nd African Membrane Society International Congress (AMSIC-2) will be held in the City of Johannesburg (South Africa) **from the 29th of July to the 1st**

of August 2018. The AMSIC-2 will be hosted by the Nanotechnology and Water Sustainability (NanoWS) Research Unit of the University of South Africa (UNISA). The NanoWS Research Unit is situated in the UNISA's College of Science, Engineering and Technology at the Science Campus in Florida (West of the City of Johannesburg). The NanoWS Research Unit has various focus areas of research under which numerous strategic projects relating to nanotechnology and water research are developed. Research topics that will be addressed during AMSIC-2 include, among others:

- UF, NF, RO, FO and mixed matrix membranes (fabrication and applications),
- Fabrication and modification of ceramic, ceramic-polymeric and hollow fibre membranes,
- Composites, nanocomposites, nanomaterials in filtration,
- Membranes coupled with renewable energy sources,
- Hybrid membrane filtration systems,
- Fibrous media for air and liquid filtration.

This event aims to capture key technological advances in fields heavily dependent on membrane filtration such as Water, Biotechnology and Biomedical sciences, Microelectronics, Chemical Manufacturing, Oil and Gas, and Power Generation.

As for membrane studies devoted to water, we will consider water purification projects, analytical/environmental research, urban water cycle and rural community development as well as bioremediation and analysis. The NanoWS research Unit is therefore well poised to host the AMSIC-2. We look forward to welcoming you to the City of Johannesburg in 2018!

AMS activities and news

AMSIC-2 will take place at the University of South Africa, Johannesburg, South-Africa from July 29 to August 1, 2018). AMSIC-2 will seek to determine how filtration technologies can effectively tackle practical challenges associated with better access to clean water, improved air quality and filtration methods, the enhanced processing of industrial and biopharmaceutical fluids via environmentally friendly practices, and improved healthcare and patient protection.

AMSIC Scientific and technological tracks:

- i) Advanced materials fabrication and processes
- ii) Porous and fibrous materials and their applications
- iii) Transport and filtration mechanisms – Hybrid and smart materials

Plenary lecturers

			
Pr Glenn LIPSCOMB	Pr Jas Pal BADYAL	Pr Jianxin LI	Pr Rong WANG

From Left to Right:

- Pr Glenn Lipscomb, Department of Chemical Engineering, University of Toledo, USA
- Pr. Jas Pal Badyal, Fellow of the Royal Society, Durham University, United Kingdom
- *Topic: Scalable Smart Surfaces for Water Harvesting and Purification*
- Pr Jianxin Li, Tianjin Polytechnic University, School of Materials, China
- Prof. Rong Wang, School of Civil and Environmental Engineering, Nanyang Technological University (NTU), Singapore

Registration: <http://www.sam-ptf.com/safrica/registerE.html>

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Advanced filtration for Water, Air, Life Science & Industrial Fluids

Training at UNISA on August 1st and 2nd (after the congress)

This event entitled “*Membrane Technology for Water, Environment and Energy*” will occur at UNISA immediately after the congress. This membrane course will be led by four faculty members from Universiti Teknologi Malaysia and other AMSIC experts.

This training (sponsored by the Islamic Development Bank) is free and will host 25 students (maximum). Students and early career professionals residing in Africa are strongly encouraged to attend – see the registration tab on AMSIC website.

Announcements**Publication by AMSIC members**

Pr Raja BEN AMAR (FST, Sfax, Tunisia), AMSIC Vice President, is the co-author of a book chapter entitled "Preparation and surface modification of porous ceramic membrane for water treatment". This article was recently accepted for publication by the edition Francis & Taylor. This book called "Advanced materials for membrane fabrication and modification" is co-published by **Pr Woei Jye LAU** (UTM, Malaysia).

Dr Sidy BA (Univ. of Sherbrooke, Canada and faculty at IPR of Mali) AMSIC Director wrote this book: "Le péril de la pollution sur le fleuve Niger". It can be found online at:
<http://www.editions-harmattan.fr/index.asp?navig=catalogue&obj=livre&no=58739>
Amazon.fr or Canada : leslibraires.ca or Belgique : fnac.be

Pr Abulnomen ELHASSADI (University of Benghazi, Lybia), received acceptance of his book publication entitled "Perspective of the Water Shortage Problem (WSP) in Libya" (ISBN 978-620-2-30766-6). This book edited and published by Scholars' Press and can be found at <https://www.scholarspress.com//system/covergenerator/build/7837>

Dr Sudip Chakraborty (faculty, university of Calabria, Italy) co-wrote "A review of polymeric membranes and processes for potable water reuse".

Sidy Ba, Lounes Haroune, Lassine, Soumano, Jean-Phillipe Bellenger, J. Peter Jones, Hubert Cabana (2018). A hybrid bioreactor based on insolubilized tyrosinase and laccase catalysis and microfiltration membrane remove pharmaceuticals from wastewater. *Chemosphere*, 201, 749-755.

Academic achievement

An AMSIC member **Dadi Dessalegn** is now **Doctor Dessalegn** after he successfully defended his doctoral dissertation co-advised by Prof. Bart Van der Bruggen, Belgium.

Young researcher



Dr Malinga completed her BSc (Biological Sciences and Chemistry) at the University of Swaziland in 2003. She then enrolled for her MSc studies at the University of Johannesburg in 2006 where she investigated the application of cyclodextrin polymers for removal of organic pollutants from water samples collected from Rand Water Treatment Plant and a Coal Fired Power Station. In 2009, she was awarded the University of Johannesburg-New Generation Scholarship which enabled her to pursue her PhD studies. This scholarship was aimed at producing young academics that would be later recruited by the University of Johannesburg as part of staff development programme. She was later awarded a Postdoctoral Research Fellowship at the Department of Applied Chemistry in 2013. After the fellowship, she was employed by the University of Johannesburg in February 2014 as a Lecturer and was recently promoted to a Senior lecturer. She is currently involved in lecturing chemistry to both undergraduate and postgraduate students. She is involved in

teaching the MSc Nanoscience and holds portfolios in the Department such as the organiser of the annual UJ-ESKOM joint workshop. The main focus of the Dr Malinga's research is in nanotechnology and water research. Specifically, she develops new reactive membranes which are embedded with materials such as dendrimers, hyperbranched polymers, bimetallic nanoparticles and enzymes. These reactive membranes are evaluated for the removal of various pollutants such as humic acid and chlorinated organic pollutants. Dr Malinga has authored/co-authored a total number of 21 publications and one book chapter, and her research work has been presented at 14 scientific conferences. She is currently supervising and co-supervising 10 postgraduate students at the University of Johannesburg, Department of Applied Chemistry. She has graduated 5 postgraduate students of which three obtained cum laude. Her h-index is 7 according to Google scholar. Dr Soraya Malinga holds research grants from Water Research Commission, National Research Funding and ESKOM tertiary scholarship programme to sponsor her research interests. She has formed collaborations with institutions such as Stellenbosch University and ESKOM. Dr Malinga has been involved in several community engagements. She has reviewed articles for various journals including the Chemical Engineering Journal, Desalination & Water Treatment Journal, Water SA, Colloid and Polymer Science, African Membrane Society conference proceedings, and the Arabian Journal of Chemistry. She has reviewed many funding applications submitted to the National Research Foundation namely NRF/Thuthuka proposals, NRF rating applications, NRF competitive support and NRF/KIC travel grant. Dr Malinga has served as a reference group member at the Water Research Commission and she is a member of the Department of Science and Technology/Nanotechnology Innovation Centre (DST/NIC) Steering Committee. She also participates during the National Science Week by demonstration of chemistry experiments to high school students and young learners thus encouraging students to take up sciences at tertiary level. She is also a member of scientific bodies such as Water Institute of Southern Africa (WISA), South African Chemical Institute (SACI), African Membrane Society (AMSIC) and Organization for Women in Science for the Developing World (OWSD), among other organizations.

List of Significant publications by Dr Malinga

1. LE Koloti, NP Gule, OA Arotiba, **SP Malinga**. Laccase immobilised dendritic nanofibrous membranes as a novel approach towards the removal of bisphenol-A. *Environmental Technology*. 39, 2018, 392-404
2. P Mathumba, AT Kuvarega, LN Dlamini, **SP Malinga**. Synthesis and characterisation of titanium dioxide nanoparticles prepared within hyperbranched polyethylenimine polymer template using modified sol-gel method. *Material letter*. 195, 2017, 172-177.

3. DE Vlotman, T Ndlovu, JC Ngila, **SP Malinga**. Hyperbranched polymer integrated membrane for the removal of Arsenic (III) in water. 2017. *Journal of Membrane Science and Research*. DOI: 10.22079/JMSR.2017.67560.1148
4. LN Nthunya, ML Masheane, **SP Malinga**, EN Nxumalo, SD Mhlanga. Environmentally Benign chitosan based nanofibers for potential use in water treatment. *Cogent Chemistry*. *Cogent Chemistry* 3 (1), 2017, 1357865.
5. ML Masheane, LN Nthunya, SS Sambaza, **SP Malinga**, EN Nxumalo, BB Mamba, SD Mhlanga. Synthesis of Fe-Ag/f-MWCNT/PES Nanostructured-Hybrid Membranes for Removal of Cr (VI) from Water. *Separation and Purification Technology*. 184, 2017, 79–87.
6. LN Nthunya, ML Masheane, **SP Malinga**, EN Nxumalo, BB Mamba, SD Mhlanga. Determination of Toxic Metals in Drinking Water Sources in the Chief Albert Luthuli Local Municipality in Mpumalanga, South Africa. *Physics and Chemistry of the Earth, Parts A/B/C*. 100, 2017, 94-100.
7. LN Nthunya, ML Masheane, **SP Malinga**, EN Nxumalo, BB Mamba, SD Mhlanga. Thermally and mechanically stable β -cyclodextrin/cellulose acetate nanofibers synthesized using an environmentally benign procedure. *International Journal of Smart nanomaterials*. 8, 2017, 1-19.
8. LN Nthunya, ML Masheane, **SP Malinga**, EN Nxumalo, TG Barnard, M Kao, ZN Tetana, SD Mhlanga. Greener Approach to Prepare Electrospun Antibacterial β -cyclodextrin/cellulose acetate nanofibers for the removal of bacteria from water. *ACS Sustainable Chemistry and Engineering*. 5, 2017, 153-160.
9. LN Nthunya, ML Masheane, **SP Malinga**, EN Nxumalo, TG Barnard, BB Mamba, SD Mhlanga. UV-assisted reduction of in situ electrospun antibacterial chitosan-based nanofibers for the removal of bacteria from water. *RSC Advances*, 6, 2016, 95936-95943.
10. ML Masheane, L Nthunya, **S Malinga**, E Nxumalo, T Barnard, S Mhlanga. Antimicrobial properties of chitosan-alumina/f-MWCNT nanocomposites. *Journal of nanotechnology*. Volume 2016, Article ID 5404529, 1-8. <http://dx.doi.org/10.1155/2016/5404529>
11. ML Masheane, L Nthunya, **S Malinga**, E Nxumalo, SD Mhlanga. Chitosan-based nanocomposites for denitrification of water. *Physics and Chemistry of the Earth, Parts A/B/C*. 100, 2017, 212-224.
12. SS Sambaza, ML Masheane, **SP Malinga**, EN Nxumalo, SD Mhlanga. Polyethyleneimine-carbon nanotube polymeric nanocomposite. *Physics and Chemistry of the Earth, Parts A/B/C*. 100, 2017, 236-246.

Chapter in a Book:

LE Koloti, NP Gule, OA Arotiba, **SP Malinga**. Recent Applications of Laccase Modified Membranes in the Removal of Bisphenol A and Other Organic Pollutants. *Emerging Trends in Chemical Sciences*, Springer Nature Publishers. 2017, 285-312.

DST/Mintek Nanotechnology Innovation Centre (NIC) – University of Johannesburg Water Node



The DST/Mintek is a national facility established in 2007 by the Department of Science and Technology (DST) and managed through Mintek. The NIC is geographically spread across the country with the development hub at Mintek and dedicated research spokes hosted at three universities, i.e. Rhodes University (RU), University of Johannesburg (UJ) and University of the Western Cape (UWC). The activities of the NIC are aimed at addressing national priorities highlighted by both the National Nanotechnology Strategy (NNS) and national research and development (R&D) strategy. Importantly, the Mintek NIC structure was built on the foundation of the National System of Innovations (NSI) to focus on driving South Africa's transformation from resource-based economy towards knowledge-based economy using nanotechnology. The NIC activities focus on many issues, including the development of research platforms, encouraging and promoting the formation of collaborative networks, addressing human capital development and bridging the “innovation chasm”.

The Department of Applied Chemistry at UJ forms part of the collaborative network with the DST/Mintek NIC with a focus on the development of nanomaterials-based solutions to solve problems relating to water treatment and wastewater remediation (i.e. Water Platform). Its vision is to provide nanotechnology solutions for effective treatment of water to improve the quality of life of the people of South Africa. It seeks to address the objectives of the National Nanotechnology Strategy of South Africa in respect of improving the quality of life by pursuing research and development in water treatment utilizing nanotechnology and polymer technology. The UJ Node focuses on the use of polymeric materials and nanomaterials that can be used in a broad range of applications such as filter-beds and ion-exchange resins. These materials are broadly adaptable to different forms including granules, beads and films/membranes. Functionality is added by suitable immobilisation of nanoscale metal, inorganic and organic units. The UJ Node's main area of research is the incorporation of these synthesised functional nanomaterials into filtration membranes and adsorption resins. The functional nanomaterials are also applied separately in trapping and destruction of water-borne pollutants, especially trace organic and inorganic molecules as well as biological agents.

The UJ Node forms part of an R&D thrust at UJ's Applied Chemistry Department that seeks solutions in water treatment and wastewater remediation and other societal challenges emanating from water stress indicators. The UJ Node works closely with local and international research institutions and industries to tap into the current cutting-edge knowledge and expertise. It also has close links with science councils (Mintek and CSIR) and water-bodies such as the Water Research Commission (WRC). The centre has a strong focus on postgraduate student development, and short working visits by collaborating partners are encouraged.

The following systems are currently being developed at the Department of Applied chemistry (Water Science and membrane research unit):

- Nanostructured polymeric adsorbent for organics and heavy metals sequestration. Adsorption modules with low pressure drops for fast removal of organics and heavy metals are designed and tested.
- Membrane supported nanocatalysts as treatment options for polluted water and wastewater. Total mineralisation and degradation of organic compounds using membrane supported nanocatalysts which have high degradation rates towards selected compounds are developed and fabricated in-house.

- Hydrophilic nanostructured polymeric membranes (UF, NF and RO/FO) for portable water production is the flagship project of the unit. Imparting hydrophilicity to old and newly formulated polymeric membranes as a way of minimising fouling and increasing membrane lifespan is generally accepted as the best method.
- Wastewater pre-treatment and post-treatment protocols as well as assessing commercial products for such applications for end-users.

EQUIPMENT USED FOR FABRICATION AND TESTING OF POLYMERIC ADSORBENTS AND MEMBRANES



Figure 1: Jar test to assess commercial polymers for pre- and post-treatment protocol development



Figure 2: Automated flatsheet membrane casting equipment and a capillary membrane forming unit



Figure 3: Dead-end cell flatsheet assessment tools



Figure 4: Crossflow assessment equipment (four and six cell set-ups) for flatsheet membranes with temperature controls



Figure 5: Flatsheet and capillary membrane modules and a benchtop assessment unit for both module types

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Our partner's corner**Assoc Prof Dr Lau Woei Jye**

Advanced Membrane Technology Research Centre (AMTEC),
Faculty of Chemical & Energy Engineering (FCEE),
Universiti Teknologi Malaysia (UTM)

It is my great honor to be invited to write an article for AMS Newsletter! Thanks to the President of African Membrane Society (AMS) – Dr Abdoulaye DOUCOURE for the invitation. Since its establishment in 2011, the society has grown significantly in terms of membership, credibility, influence and relevance not only in the region of Africa, but worldwide.

In 2016, AMS has successfully organized the 1st African Membrane Society International Congress (AMSIC-1) in Sfax, Tunisia and attracted a significant number of participants both locally and globally. However, I missed out the chance to take part in the important event.

In the coming congress (AMSIC-2) that is scheduled to take place in the City of Johannesburg, South Africa between 29 July and 1 August 2018, my colleagues and I have confirmed to take part the event. In addition, we will be organizing a post-conference workshop at the University of South Africa (UNISA) between 2 and 3 August 2018. The workshop entitled “Membrane Technology for Water, Environment and Energy” is sponsored by the Faculty of Chemical & Energy Engineering (FCEE), Universiti Teknologi Malaysia (UTM) with the cash award given by the Islamic Development Bank (IDB). FCEE won the 15th edition of IDB Science & Technology Prize (Category 2) in 2017.

I would also like to take this opportunity to thank members of the Nanotechnology and Water Sustainability (NanoWS) Research Unit, especially Prof Dr Sabelo Mhlanga and Assoc Prof Dr Edward Nxumalo as well as AMS’s President - Dr Abdoulaye Doucoure for giving full support to the workshop.

During the 2-day membrane workshop, three of my colleagues from the Advanced Membrane Technology Research Centre (AMTEC), UTM will be giving talk based on their research expertise together with me. They are Prof Dr Ahmad Fauzi Ismail (Director of AMTEC), Dr Goh Pei Sean (Research Associate of AMTEC) and Dr Hasrinah Hasbullah (Research Associate of AMTEC). The workshop aims to provide basic principle

of membrane and its industrial applications. Specifically, it will cover topics such as principle of membrane formation, membrane synthesis and characterization, membrane configuration and design, membrane process and success story of membrane applications in Malaysia.

There is no registration fee for the workshop and we wish to get interested people (e.g., postgraduate students, scientists and academic staff) to participate. Due to the limited availability of seats, early registration is strongly recommended to ensure your participation. Don't miss out on this opportunity!

We are looking forward to meeting you at the AMSIC-2 and workshop.