



The CATSA Bulletin – 2019

The official newsletter of the Catalysis Society of South Africa

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Issue V

Welcome to CATSA 2019

On behalf of the organising committee, I would like to welcome all delegates to CATSA 2019. This year, we are expecting approximately 210 delegates. In order to enhance cross-fertilisation between the diverse sub-fields the CATSA community is working on, we have chosen to mix all presentations as much as possible in this year's scientific programme, avoiding 'specialised' and parallel sessions. Next to established scientists, the programme contains quite a few student oral presentations. The best student oral and poster presentations will be awarded prizes at the Gala dinner. This year's Catalysis Society's Eminent Visitor's Award goes to Prof. Angelos M Efstathiou of the University of Cyprus. We are privileged to be able to host him and we look forward to his plenary lecture at the conference. Prof. Efstathiou will visit UCT/SUN/UWC, UKZN, SASOL/NWU, WITS/UJ/MINTEK and UP/CSIR prior to the CATSA conference. I hope that these visits will lead to long-lasting and fruitful interactions with the catalysis community in South Africa. I would like to express my deep appreciation for our sponsors, without whom the costs for registration would be at least double the amount we are actually charging. Finally, I would like to wish all of you a pleasant conference and I hope that you enjoy both the scientific programme as well as the social programme that we have put together. I also encourage you to enjoy all the amenities at Club Mykonos. If there's anything the organising committee can do to make your CATSA 2019 experience a pleasant one, then please do not hesitate to approach me or any other member of the organising committee - we can be easily recognised by our CATSA T-shirts.

Patricia Kooyman - Conference Chair CATSA 2019



Prof Dr Patricia J. Kooyman (UCT) Chairperson of the CATSA 2019 conference



Prof Angelos Efstathiou (University of Cyprus) the Eminent visitor at CATSA 2019.

From the Chairman of CATSA

Dear delegate of the 30th annual national conference of The Catalysis Society of South Africa. By virtue of your attendance of this year's conference, your membership of the Society is affirmed for the forthcoming year. CATSA, the non-profit organisation representing catalysis interests in the country, remains a vibrant and growing body, and has taken some meaningful forward strides during 2019.

The legal and fiscal requirements of our income tax- and VAT-registered NPO status remain an ongoing focus for CATSA, especially as we come to terms with the additional obligations. In this regard I would like to take the opportunity to thank our Treasurer, Jack V. Fletcher, for his tireless efforts in managing all financial compliancy obligations. Furthermore, over the past two years, we have formalised our membership database and certification process, and continue to make adjustments to optimise this endeavour. Nico Fischer, who not only spearheaded this initiative, has also volunteered to fulfil the *ad hoc* role of CATSA Secretary to maintain historical records, oversee protocols and administer the Society's legislative obligations.

As in previous years, CATSA continues to be in a healthy financial position and, in keeping with a major aim of the Society, we have been able to financially support a number of postgraduate students who presented their work at international conferences – a grand total of thirteen students for 2019. Reports on their experiences can be found in this newsletter.

Unfortunately, the 'Roadmap for Catalysis in South Africa' initiative that was reinvigorated during the course of last year has seen no further progress in 2019 due to the unavailability of the principal coordinator, Philip Gibson. Without an individual to spearhead the process, the initiative has once again needed to be suspended.

I would also like to take this opportunity to formally welcome Prof Angelos Efstathiou as this year's CATSA Eminent Visitor. Through this award we are able to attract leading scientists to undertake a focused visit to the catalysis community of South Africa in the interest of promoting international scientific exchange in the field of catalysis. This initiative continues to bear much fruit in the form of cemented relationships, research collaboration and student exchange.

Lastly, I would like to extend my great appreciation to a dedicated and hardworking CATSA Committee, who have selflessly contributed to the smooth operation and governance of the Society, especially as we grapple with the changing organisational dynamics.

In closing I wish you all a great 2019 conference and surely speak for all of us when I extend my gratitude to this year's organising committee, especially Prof Patricia Kooyman and Dr Jack V. Fletcher. I trust we will all have a memorable and constructive time together.

Stephen Roberts – Chairperson CATSA

The CATSA Committee 2019

During the Annual General Meeting of the Society, held during the 2018 annual conference, new members to the 2019 CATSA Committee were elected for a two year term. The new committee is as follows:

Chairperson | Stephen Roberts (UCT)
Secretary/Treasurer | Jack V Fletcher (UCT)
2019 Conference Chairperson (representative) | Jack V Fletcher (UCT)
Media Officer | Cornie van Sittert (NWU)
Student Representative | Rosalind Stegman (UCT)
Francois du Toit (Clariant)
Nico Fischer (UCT)
Holger Friedrich (UKZN)
Cobus Kriek (NWU)
Marilé Landman (UP)
Banothile Makhubela (UJ)
Selwyn Mapolie (US)
John Moma (WITS)
Gary Pattrick (MINTEK)
Nico Prinsloo (SASOL)
Andrew Swarts (NWU)



Prof Gregory Jerkiewicz (Queen's University, Canada) receiving Eminent Award from Mr S Roberts



Mr Philip Gibson (SASOL) receiving Lifetime Achievement Award from Mr S Roberts

CATSA 2018

The 29th Annual CATSA Conference took place at Legend Golf and Safari Resort in Limpopo over the period 11 to 14 November 2018. The conference was attended by 178 delegates, of which 86 were post-graduate students. The scientific programme catered for all the subdivisions of catalysis. The scientific programme consisted of 2 plenary, 6 keynote, 34 oral and 67 poster presentations.

The CATSA 2018 Eminent visitor was Prof Gregory Jerkiewicz from Queen's University, Canada. His plenary address dealt with the degradation of nanoscopic and bulk platinum electrocatalysts. The recipient of the Lifetime Achievement Award, Mr Philip Gibson gave an overview of the Fischer-Tropsch catalysis. The prize for the best student oral presentation went to Bianca Davids from UJ and the prize for best student poster went to Tsepiso Kabi from UNISA.

In terms of social activities, CATSA 2018 did not disappoint. One of the highlights was the Poretech challenge, where various team competed by playing darts. The winners was the scientists.

In general from all the feedback received, CATSA 2018 was an overwhelming success.

Cornie van Sittert - Conference Chair CATSA 2018



Bianca Davids (left on photo) from UJ received the Clariant best student oral award at CATSA 2018



Tsepiso Kabi (second from right) from UNISA received the Micro-meterics best student poster award at CATSA 2018

Outlook CATSA 2019

The 31st Catalysis Society of South Africa (CATSA) international conference will be held from 8 to 11 December 2020 at the luxurious and beautiful Champagne Sports Resort, Drakensburg, KwaZulu-Natal, South Africa. The conference will be organized by the University of KwaZulu-Natal, under the chair of Prof Stephen Ojwach. The theme of the conference "*Catalysis for sustainable society*" is in tandem with the current global focus towards cleaner and environmentally benign synthetic and industrial processes. During the conference, over 200 local and international delegates, are expected to deliver plenary, keynote and oral lectures, including poster presentations, covering the areas of homogeneous, heterogeneous, enzyme, and electro-catalysis.

The 31st CATSA conference eminent visitor is Prof Paul Chirik, who currently holds the position of Edwards S. Sanford Professor of Chemistry at the Princeton University, United States of America. In summary, Prof Chirik obtained his PhD in 2000 under the supervision of Prof John Bercaw, studying the mechanism of metallocene-catalyzed olefin polymerization and hydrometallation at California Institute of Technology, USA. Prof Chirik's current research areas is in the sustainable and environmentally -friendly catalysis with earth abundant elements. He was appointed Editor-in-Chief of Organometallics journal in 2015 and has received numerous accolades including the Arthur C. Cope Scholar Award, the Blavatnik Award for Young Scientists, and Presidential Green Chemistry Challenge Award amongst others. Prof Chirik has co-authored over 250 research articles in reputable journals such as Nature, Journal of American Chemical Society, Inorganic Chemistry, Angewandte, ACS Catalysis, Organometallics amongst others, with over 10 000 citations and an h-index of 55. He has supervised over 30 PhD candidates and 200 postdoctoral associated. His research areas in sustainable catalysis using earth abundant elements and renewable resources (for instance, 2019 Nature paper, *A fresh approach to ammonia syntheses*) is thus in line with the theme of the conference and in general to the current focus on managing global warming and climate change.

Stephen Ojwach - Conference Chair CATSA 2020

Student travel grants 2019

The Catalysis Society of South Africa offers every year a number of travel grants to students based at a South African institution to support attendance of local or international conferences. The grants are awarded based on a competitive application reviewed by the Committee (for more information see <http://www.catsa.org.za/awards/student-travel-awards>). In 2019 two grants were awarded, to Chelsea Tucker (PhD, UCT) and Mope Malefane (PhD, UNISA). As part of the award the students are requested to share their experience and gathered insights at the attended event with the Society.



From left to right: Chelsea Tucker with Dr Wenping Ma, a world expert on high conversion Fischer-Tropsch. View of the Chicago river captured during the conference. Chelsea Tucker after presenting her work on Mn promoted cobalt catalysts.

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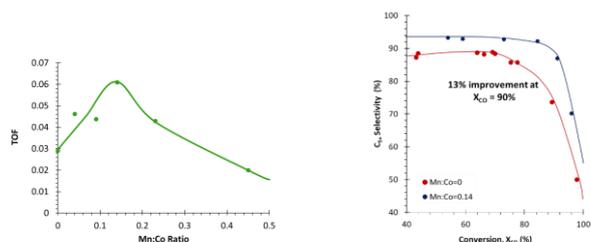
I, Chelsea Tucker, a PhD student in the Catalysis Institute, was awarded a CATSA travel grant for an oral at the North American Catalysis Society Meeting, in Chicago in June 2019. I was invited to present my paper on the “Manganese promotion of Pt-Co/Al₂O₃ for single pass Fischer-Tropsch biomass-to-liquid”.

The conference started with a group Sunday workshops, of which I attended **"Advancing Catalysis Research with X-ray Absorption Spectroscopy"** with Simon R. Bare, Adam S. Hoffman, and Alexey Boubnov of Stanford Synchrotron Radiation Lightsource (SSRL), SLAC National Accelerator Laboratory. The workshop aimed to give a background to XAS and acted as beginner's course on how the equipment works from a physical point of view. On top of this, the course provided a very holistic and in-depth look at sample preparation and pointed out the main questions one should ask before booking a slot at a synchrotron. The course also included a remote controlled XAS experiment, which we were able to watch as the day progressed. The final segment included a very detailed look at how to analyze the data that is captured and post-processing using XAS software.

Monday morning began with a plenary from Hai-Ying Chen, recipient of the 2019 Eugene J. Houdry Award in Applied Catalysis, who spoke about the history of advancements in the diesel exhaust emission control. Further plenaries included Javier Pérez-Ramírez, and Enrique Iglesia – of whom has inspired much of the work done in our group.

The sessions throughout the five days consisted of 6 parallel sessions, of which topics included fossil fuel to fuels, electrocatalysis, photocatalysis, NO_x processing, lignin deconstruction and many more. The session of Fischer-Tropsch, methanol synthesis and hydrogen production were particularly enlightening. Work presented by the Politecnico di Milano on foam reactors during the former session illustrated another aspect of the high conversion, small scale waste-to-fuel system and led to new ideas for my own research.

My presentation was during a Thursday session, and I was thrilled to have in attendance Dr Wenping Ma, whose work on high conversion Fischer-Tropsch was the catalyst for my own research into small-scale waste-to-liquid.



From left to right: Effect of Mn:Co ratio on the turnover frequency of Mn-Pt-Co/Al₂O₃. Effect of Mn:Co ratio on the selectivity of our desired product, C₅₊.

My presentation focused on improved Mn – promoted cobalt catalysts designed to decrease the selectivity of our undesired products (methane and carbon dioxide) when operating under high CO conversion. Six different catalysts were tested, with a Mn:Co ratio from 0 to 0.5. Our results indicate that not only can Mn promotion enhance selectivity but can also improve turnover frequency by up to 100%. My presentation led to a group discussion between various research group leaders after the session.

My trip to the North American Catalysis Society Meeting led to phenomenal opportunities such as an offer to visit the Northwestern University's catalysis laboratories as well as Chalmers University in Sweden. I also made contacts across the world in the Fischer-Tropsch space, as well as new and interesting avenues for a future post doctorate.

I would strongly encourage other students in the CATSA community to take on the opportunity to attend the North American Catalysis Society Meeting in New York in 2021.

I would like to extend a huge thank you to the CATSA committee for funding this phenomenal experience.

I, Mope Malefane (a PhD student at UNISA), would like to acknowledge the committee for granting me the opportunity to attend the 6th European conference on Environmental Applications of Advanced Oxidation Processes (EAAOP-6) in Slovenia, Ljubljana for an oral presentation in June 2019. The travel grant I was given showered me with what I would call “a lifetime experience in relation to social, economic and academic acquaintances”.

Socially, Slovenia predominantly the capital city of the country, is a place to be with Portoroz the centre of commotion with rich history, friendly citizens, and tourist attraction places not wrangling the weather and an opportunity for a swim. The presence of the sea helped improve the economic grade of people in this area and the one that stood out for me was an over 100 years old traditional way to make salt. Attending the EAAOP-6 conference humbled me with knowledge and understanding of applications of advanced oxidation technologies for environmental applications such as air pollution control, hydrogen generation, electrochromic applications and abatement of different pollutants from industries like meat abattoir to keep up with the increasingly stringent discharge limits of Europe. The highlight of my attendance was the applications of density functional theory (DFT) for development of pilot scale plants and the removal of hydrogen sulphite (H₂S) in wastewater. Words alone cannot describe how grateful I am for the opportunity granted to me to learn from the best Professors in advanced oxidation processes and the approaches, and of course challenges they had to go through to be at the summit of their careers. In conclusion, my work gained recognition despite not getting an award as the best students won but I am pleased with the presentation and quality of work that resulted in some Professors showing interest for collaborations with me and my institution in future.

I am mostly honoured and grateful for the opportunity that CATSA offered me towards attending this conference where over 300 contributions were presented.

ANSDAC 



Early in 2018, c*change researcher Associate Professor Nico Fischer also managed to secure funding from the Royal Academy of Engineering with a consortium of SASOL, UWC, UCT and the

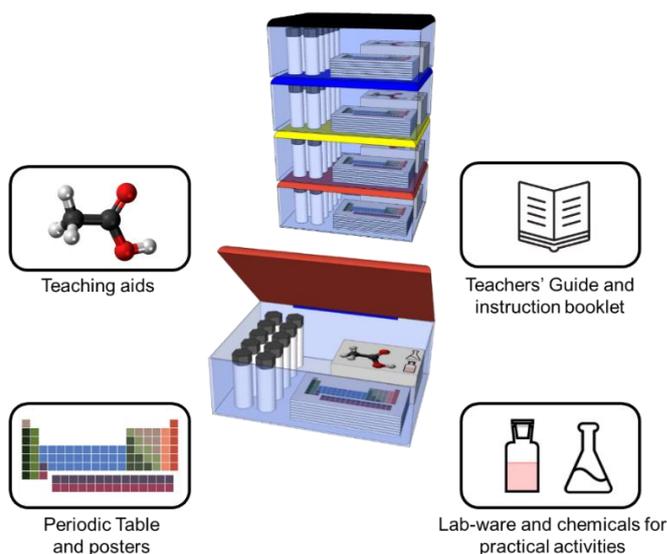
University of Glasgow, to hold two training workshops on synchrotron and neutron data analysis in 2018 and 2019. The project termed ANSDAC (African Neutron and Synchrotron Data Analysis Competency www.ANSDAC.com) is hosting 15-20 emerging faculty researchers from Africa per workshop who will be trained by UK experts in the art of data analysis as well as how to successfully apply for beamtime. The workshops and accommodation are fully funded and free to the participants. The first workshop was held in Cape Town from the 28th of November to the 7th of December 2018. 15 Participants from 11 (South) African Institutions attended. They were taught by South African experts from SASOL, the University of Pretoria and XRD Analysis & Consulting about the fundamentals in crystallography and X-ray diffraction. Through support by Malvern Panalytical and Bruker the participants got first-hand experience in the use of the most established commercial analysis software as well as freeware options. After a weekend learning aspects of Cape Town's history and visiting the Cape of Good Hope National Park, experts from the Diamond Light Source, the ISIS Neutron and Muon Source and the Loughborough University (all UK) took over, introducing X-ray absorption spectroscopy, XANES and EXAFS data analysis, shared tricks to write successful beamline applications and ventured into Neutron scattering. The workshop was a great success, so much that the Global Challenges Research Fund project START (<http://start-project.org>) has joined forces with the ANSDAC team to extend the lifetime of the project to 2020. The 2019 ANSDAC workshop will take place from the 16th to the 24th of October in the Department of Chemical Engineering at UCT.



Building on the previously developed Chemical Industries Resource Packs, a practical resource pack for high school teachers closely aligned to the national curriculum to empower teachers to demonstrate theoretically thought material with various practicals was developed. The team DST-NRF Centre of Catalysis c*change (Banothile Makhubela (UJ), Andrew Swarts (NWU), Nico Fischer (UCT) Toerien (UCT)) worked on the project coined c*hemRoots in 2017 and developed a clear vision for a long-term intervention. Through three workshops with teachers, held in Cape Town, Potchefstroom and Johannesburg, the actual needs of teachers were canvassed and the first developments focusing on the 'acid base chemistry' trialled. The acid base pack was produced (200 kits) and launched at a teachers' conference in the Western Cape late in January 2018 (120 teachers were present). The overwhelmingly positive responses from the different workshops led the project team to develop a business plan in collaboration with the Schools' Development Unit (SDU) at UCT. The plan envisages the development of resource materials in five curriculum aligned topics over three years and the distribution of said materials through workshops. To increase the impact and ensure lasting interaction, credit bearing short courses supporting the developed materials will be developed and are planned to be offered to teachers by the SDU. Additionally, an online platform for exchanges between teachers to establish a community of professionals will be developed.

Late in 2018 c*hemRoots distributed acid base packs to the Cape Town Science Centre and the Unizulu Science Centre. Both centres have taken the developed kits up into their offerings from which teachers can select when visiting the institutions with

learners. The c*hemRoots team is currently investigating this approach as possible main distribution pathway.



Through the collaboration with the Cape Town Science Centre c*hemRoots has also updated a previously developed (for the Chemical Industries Resource Packs) periodic table. Under the umbrella of the International Year of the Periodic Table, this free high-resolution resource will be distributed to teachers and learners by the Science Centre and digitally beyond (<https://www.cchange.ac.za/wp-content/uploads/2019/02/A2-Periodic-table.pdf>). A pocket-sized version of the periodic table is in discussion and will probably be designed going forward.

Sponsors of CATSA 2019



From the Editor

Dear member of the Catalysis Society of South Africa, without your contributions a newsletter is not possible. The purpose of the newsletter is to serve as a platform to report on new developments and past year's events. For this reason I would like to invite all Society members to send contributions to me in good time before the next CATSA conference.

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