



The CATSA Bulletin – 2020

The official newsletter of the Catalysis Society of South Africa

149-462 NPO

Published November 2020

Issue VI

From the Chairperson of CATSA

Dear Member of the Catalysis Society of South Africa (CATSA), it is with a heavy heart that I am writing this article for the 2020 Newsletter of CATSA. As you know by now, we as the committee had to take the hard decision to postpone the conference (CATSA 2020) to next year. It is the first time in 31 years that the Members of the Society did not meet for our annual conference. I believe that the annual CATSA conference is a highlight for most researchers working in catalysis in South Africa. The conference is the place where new research networks in catalysis are formed, old ones are renewed, and co-workers become friends. The postponement of CATSA entailed many firsts for CATSA. For example, extension of your membership until November 2021, having our AGM on a virtual platform, and voting electronically for members to serve on the committee for the period 2020/2021. Regarding the AGM and the voting this year, I would like to give a special thanks to Nico Fischer (our Secretary) for making it possible.



*Prof Cornie van Sittert
– CATSA Chair – 2020*

I would also like to thank each member that took time out of their busy schedules to attend the AGM this year. Due to COVID-19, we were not the only body that had to postpone or even cancel conferences. The 17th ICC conference was cancelled and the 15th Europa Congress on Catalysis was postponed, first to 29 August – 3 September 2021 and then again to 2022 or 2023. Due to the postponement or cancellation of conferences and the travel restrictions, no travel grants were made this year. Lastly, I would like to extend my appreciation to each member on the CATSA Committee for their selfless contributions to the smooth operation and governance of the Society. I would like to express a word of special thanks to Stephen Roberts, the former Chairperson of the Society for his dedication to CATSA over many years and his exceptional leadership during 2018 and 2019, and to Jack Fletcher for looking after the finances of CATSA for several years.

Cornie van Sittert - CATSA Chair 2020

From the Editor



*Dr John Moma – CATSA
Media Officer and
Newsletter Editor - 2020*

It is perfectly true, as the philosophers say, that life must be understood backwards. But they forget the other proposition that it must be lived forwards. When the last conference was held in Langebaan in 2019, the stage was set for yet another exciting conference which was advertised to take place at the luxurious and beautiful Champagne Sports Resort, Drakensburg, KwaZulu-Natal from 8 to 11 November 2020. Towards the end of 2019, mysterious cases of pneumonia were detected in the City of Wuhan in China's Hubei Province and in the first week of 2020, the causative agent was identified as a new corona virus (2019-nCoV), and the disease was later named as COVID-19 by the WHO.

Within the next couple of months, the virus spread extensively to many nations across the world – including South Africa, with devastating effects that no one had imagined at the Langebaan conference. In order to mitigate and contain the spread of the virus, harsh restrictions were

imposed across many nations. In March 2020, the government of South Africa declared a national state of disaster under the Disaster Management Act in response to the coronavirus pandemic with restrictions to many activities including international and local travel, closure of academic institutions, closure of hotels and conference venues and the assembly of people amongst many others. With many uncertainties in the COVID-19 environment in South Africa, the CATSA executive committee in its meeting on 12 May 2020, had to take the hard decision to postpone the 2020 conference to 2021.

2020 has therefore been an extraordinary year for the Society in that in its 31 years of existence, it is the first year that a scheduled conference has not taken place. In spite of this challenge, we remain confident that quality research activities in the field of catalysis are on-going across all our academic and research partner institutions and well as industry and that in 2021, we will have another vibrant and exciting conference. To keep updated with research activities, we thought it appropriate to publish an annual list of articles from CATSA members.

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The CATSA Committee 2020

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Secretary | Nico Fischer (UCT)

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Marile Landman (UP)

Selwyn Mapolie (SUN)

Gary Patrick (Mintek)

Xinying Liu (UNISA)

Mzamo Shoji (UKZN)

Francois Du Toit (Clariant)

Thirusa Naicker (SASOL)

Martin Onani (UWC)

Outlook CATSA 2021



Prof Stephen Ojwach (UKZN) Chairperson of the CATSA 2021 conference



Prof Paul Chirik (Princeton University, USA) the Eminent visitor at CATSA 2021.

The 31st Catalysis Society of South Africa (CATSA) international conference will be held from 7 to 10 November 2021 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 as well as 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 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 associates. 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.

CATSA 2019

The 30th Annual CATSA Conference themed “*From Nanomaterials to Industrial Process*” took place at the Club Mykonos Resort in Langebaan, Western Cape from 10 to 13 November 2019. The conference was attended by 186 delegates, the majority from South African higher education institutions, but also from Industry. International delegates from Botswana, Europe, the USA, Botswana and Brazil were also in attendance. The scientific programme catered for all the subdivisions of catalysis. The Eminent visitor was Prof Angelos Efstathiou from the University of Cyprus who gave a plenary address on “*transient kinetics method and SSITKA: their importance in the advancement of catalytic science*”. There were 31 other oral presentations many of which were from students and the standards of these presentations were very good giving the judges a tough task to determine the winners. The best student oral presentation prize was awarded to Aaron Folkard from UKZN.

Apart from the scientific programme, there were lots of social activities with the Poretech challenge being a sandcastle competition between Chemists and Engineers, with the Chemists winning.

I would like to express gratitude to the organizing committee members, the student helpers and the delegates for making the conference a huge success. In addition, my sincere appreciation to all the sponsors, many of which are long term partners of the society, who made generous donations to ensure that we were able to host a successful event.

Patricia Kooyman - Conference Chair CATSA 2019



Aaron Folkard (UKZN) receiving the Clariant best student oral award.



Prof Angelos Efstathiou (University of Cyprus) receiving the Eminent Visitor Award from Mr Stephen Roberts.

The European Federation of Catalysis Societies and the International Association of Catalysis Societies in 2020

The Catalysis Society of South Africa is an active member of both the International Association of Catalysis Societies (IACS) and the European Federation of Catalysis Societies (EFCATS). CATSA’s current representatives are Prof Holger Friedrich (UKZN) and Prof Nico Fischer (UCT). IACS is the custodian of the International Congress of Catalysis (ICC) organized every four years, while the biannual EuropaCat is

organized under the auspices of EFCATS. In 2020 the ICC was supposed to be held in San Diego, U.S.A., and organized by the North American Catalysis Society. Three CATSA postgraduate students even received a Young Scientist Travel Award Prize to the value of \$500 which would have covered their conference registration costs. Unfortunately, due to the ongoing COVID-19 pandemic the conference had to be cancelled. IACS did incur a significant loss as several payments had been done at the time of cancellation and were not fully reimbursed. The North American Catalysis Society offered to attempt to hold the ICC in 2021, out

of the traditional 4 year cycle, but the financial risk was deemed as too high. The next ICC will therefore be held in 2024. The EFCATS flagship conference, EuropaCat is currently scheduled for August 2021 in Prague. The abstract submission is currently open and the deadline has been communicated to be the 31st of January 2021. The feasibility of the conference (expected attendance 1500 to 2000 delegates) will depend strongly on the global developments over the next month. Will a vaccine be available and if so how many doses can be produced and distributed. The conference calendar for 2021 will probably remain largely empty or online, which is a pity, especially for current senior postgraduate students. Let us all hope that by the end of 2021 we have not settled into a new normal but actually have regained some of our beloved old normal, and who knows, maybe CATSA 2021 can kickstart the post COVID conference season.

African Neutron and Synchrotron Data Analysis Competency (ANSDAC.)

In the past two decades or so, synchrotron-based material characterization techniques have developed into a key cornerstone of scientific research spanning a multitude of fields from archaeology to molecular biology, chemistry and material sciences. Most research fields addressing global challenges, such as the development of efficient battery and PV materials and very acutely virology, rely heavily on the information synchrotron facilities can provide, which is not accessible or overlooked with classic laboratory-based techniques. However, access to these infrastructures remains competitive and often depended on the ability of research teams to demonstrate capacity to analyse, interpret and publish the collected data. Such expertise is primarily linked to exposure and access. The African research community is lacking significantly in this field. As the only continent, besides the Antarctic, without an own synchrotron facility, African researchers are facing bigger challenges than their counterparts in Europe to develop into experienced users with an acknowledged track record. While the synchrotron facilities worldwide offer regular data analysis short courses, these are often oversubscribed and, due to the significant travel and accommodation costs, prohibitive for African researchers. This is especially true for emerging researchers and researchers from previously disadvantaged backgrounds or institutions. The lack of opportunity and the resulting danger of losing contact with the scientific community is the main driving force of the African Neutron and Synchrotron Data Analysis Competency (www.ANSDAC.com) project. Funded for two years by the Newton Fund through the Royal Academy of Engineering, the project was developed as vehicle to provide inclusive and hands on training in the analysis of X-ray diffraction and absorption as well as neutron scattering techniques. The partnership between the Universities of Glasgow and the DSI-NRF Centre of Excellence in Catalysis c*change (www.cchange.ac.za) at the University of Cape Town as well as the South African industry partner SASOL allowed to tap into large research networks identifying a mixture of South African and UK experts delivering the lectures over a 10-day period. The target group for the ANSDAC workshops was identified to be young emerging faculty researchers or senior PhD students and postdoctoral fellows with the demonstrated intent to pursue a career in academia or in public research institutions. Two workshops were held to date (2018 and 2019). Each year the project team was overwhelmed by applications equating an oversubscription of a factor 4-5. Participants were selected based on their background, career stage, motivational letter and commitment to act as a seed in their own institutions. In two workshops, 30 individuals from 16 South African and 3 African Universities have been trained.

From the pool of participants, to date, 20 % have been successful in securing beamtime at a synchrotron facility.



19 institutions which have sent emerging researchers to the ANSDAC workshops in 2018 and 2019.

Beyond, the ANSDAC project has engaged with multiple role players and has established productive relationships with networks such as the African Light Source Project (www.africanlightsource.org) and the GCRF project Synchrotron Techniques for African Research and Technology (START, www.start-project.org). Since 2019 the ANSDAC project has entered an official collaboration with the START Energy Materials team providing additional funding to extend the project scope by one year and deliver a third workshop in 2020. Unfortunately the COVID-19 halted all activities and we hope to have our third workshop late in 2021.

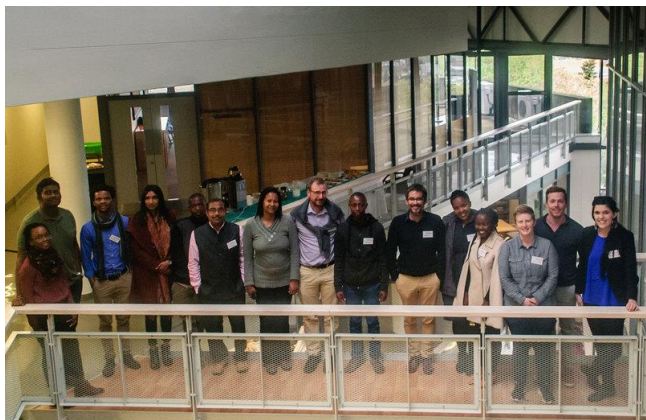
Waste-to-fuel project: an IChemE Global Awards Finalist

UCT's Professor Eric van Steen, based at the Catalysis Institute and holder of the South African Research Chairs Initiative (SARChI) Chair in Reaction Engineering is a member of an intercontinental research team from Brazil, India and South Africa which has been announced as an IChemE Global awards 2020 finalist in the Energy Category for the Decentralised Diesel system which aims to produce fuel from waste.

The IChemE Global Awards celebrate chemical, process and biochemical excellence and are widely considered the world's most prestigious chemical engineering awards. The waste-to-fuel project team, which spans three continents, hopes to join other winners the likes of the University of Oxford, Imperial College London and Johnson Matthey when a winner is announced in later this year.

"It is of course great to be named a finalist for this IChemE award. We are excited to present our design to this world audience and get greater publicity for this project," said Professor Van Steen.

The team also includes postgraduates from India and UCT, one of which is PhD candidate Chelsea Tucker, the research coordinator for the project. Tucker's PhD is focused on developing the overall process design of the project, known as the Decentralised Diesel system.



A photograph taken in 2018 at the first workshop of the collaboration between UCT; CSIR-Indian Institute of Petroleum, India; and the Brazilian Synchrotron Light Laboratory.

The Decentralised Diesel system is based on technology used by Sasol in South Africa to produce fuels from coal and natural gas. Using biogas rather than solid waste allows the system to shift from a technology called waste gasification (which typically costs up to 45% of the entire process) to a process called reforming. Reforming is significantly cheaper and is far more robust, allowing for a high variability in the waste material used.

The design aims to turn waste into diesel and power and could potentially change the face of African cities. Waste is a direct result of rapid urbanisation and economic growth, and is increasing the need for more energy sources, said Van Steen.

UP-SU Chemistry Outreach Initiative: From CATSA colleagues to outreach partners.

Dr Rehana Malgas-Enus (Stellenbosch University) launched the SUNCOI. Satellite programme officially in February 2018, as the SUNCOI model has proven to be successful in the Western Cape area, hence more schools across South Africa would be able to benefit from this project by implementing the model at participating universities. In 2017, the University of Pretoria joined the project with Prof Marilé Landman as UP organiser. This joint initiative is called UP-SUNCOI and includes the Department of Chemistry at Stellenbosch University as well as the Department of Chemistry and the Department of Science, Mathematics and Technology Education (SMTE) at the University of Pretoria. The main objective of this project is to assist Grade 10, 11 and 12 school pupils from disadvantaged schools, where the necessary laboratory facilities do not exist, to complete the compulsory practical component of their Physical Science school subject. Many underprivileged schools have no access to laboratory space or chemicals. Despite this, the teachers are still expected to present prescribed practicals to their Grade 10 - 12 learners. These practicals are an essential part of the learners' assessment. The lack of infrastructure or resources to host these practicals poses a big problem to teachers and subsequently to the learners. Unfortunately, this also leads to a decline in the number of learners in physical sciences, ineffective

practical work and a lack of confidence on the part of teachers to do practical work. This project provides UP with the opportunity to make optimal use of resources and share privileges by allowing communities access to its chemistry laboratories. It furthermore supports the interaction of an entire community of scholars: the Department of Science, Mathematics and Technology Education pre-service teacher students (students training to become future teachers); in-service teachers (current high school teachers); school learners and university post-graduate students; chemistry- and teacher education lecturers. The staff of the University of Pretoria's Chemistry department has launched this community engagement (CE) initiative together with disadvantaged schools in the Pretoria area. The two schools to benefit from this initiative to date have been Prosperitus Secondary School in Eersterust and Mamelodi High School in Mamelodi. Both the teachers of these pupils as well as postgraduate students of the tertiary institutions involved benefit from this community engagement initiative.



Grade 11 learners doing their prescribed chemistry practical, Intermolecular Forces, in the University of Pretoria's labs.

Academics from UP's Department of Chemistry volunteer as presenters while postgraduate student volunteers serve as demonstrators on the day of the event every year. The events take place on a Saturday and the complete prescribed practical syllabus is dealt with in a single day.



Prof Marilé Landman, with postgraduate chemistry student volunteers.

Pupils are transported to the venue in buses, provided with a breakfast snack and supplied with a white laboratory coat and safety goggles before commencement of the formal activities. Presentations include a safety talk and pre-practical lectures before the pupils are assisted with their experimental work, in groups of three, in the laboratory. Events have been hosted on both the main campus (Hatfield) in the laboratories of the Department of Chemistry and the Groenkloof campus' SMTE laboratories. Sponsors for this initiative has been numerous and include various departments within the University of Pretoria as well as external funding from NRF, DST, Labotech, Advanced African Technology (AAT) and Amka.

-Marilé Landman

UCT's Chelsea Tucker awarded a L'Oreal-UNESCO for Women in Science



Chelsea Tucker
University of Cape Town

Chelsea Tucker, a doctoral researcher at the Catalysis Institute in the Department of Chemical Engineering, UCT, received the L'Oreal-UNESCO's Women In Science Award in 2019 for her work on manganese promotion of cobalt Fischer-Tropsch synthesis. Chelsea is designing a catalyst for a simple, cheap, small-scale waste-to-fuel process that converts organic waste from communities into low-carbon

diesel and electricity. Chelsea is one amongst only seven chosen to participate in the inaugural L'Oréal-UNESCO For Women in Science South African National Young Talents programme. The programme identifies and rewards talented young women scientists in the fields of formal sciences, life sciences, environmental sciences, physical sciences, engineering and technological sciences. We congratulate Chelsea on this esteemed award.

SU's Jacquin October leaves for Germany to pursue his postdoctoral fellowship at the Max Planck Institute

CATSA student member, Jacquin October, completed his PhD under the supervision of Prof Selwyn Mapolie, in the Department of Chemistry and Polymer Sciences at Stellenbosch University, in 2020. Jacquin recently left for his postdoctoral studies at the Max Planck Institute in Germany, where he has joined the research group of previous CATSA Eminent Visitor Recipient, Prof Walter Leitner, with Dr Andreas Vorholt as group leader.



Dr Jacquin October, Postdoctoral Fellow at the Max-Planck Institute for Chemical Energy Conversion.

Research at the Max Planck Institute for Chemical Energy Conversion (MPI-CEC) involves the development of technologies for the conversion of renewable energy and feedstocks to sustainable fuels and chemical products. This is an excellent opportunity for Dr October and we wish him well on this journey.

List of publications from 2019 conference presentations:

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2. de Doncker, S.; Casimiro, A.; Kotze, IA; Ngubane, S.; Smith, G.S. Bimetallic Paddlewheel-type Dirhodium(II,II) Acetate and Formamidate Complexes: Synthesis, Structure, Electrochemistry, and Hydroformylation Activity. *Inorg. Chem.* **2020**, *59*, 12928–12940.
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7. Rajan, ZSHS; Binner, T.; Kooyman, P.; Susac, D.; Mohamed, R. Organometallic chemical deposition of crystalline iridium oxide nanoparticles on antimony-doped tin oxide support with high-performance for the oxygen evolution reaction. *Catalysis Science & Technology* **2020**, doi:10.1039/DOCY00470G.
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10. Marais, L.; Vosloo, H.C.M.; Swarts, A.J. The development of a Cu(I)/pyrazolopyridineamine catalyst system for the hydroxylation of aryl halides. *Molecular Catalysis* **2020**, *486*, 110839.
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13. Okoye-Chine, C.G.; Mbuya, C.O.L.; Ntelane, T.S.; Moyo, M.; Hildebrandt, D.; The effect of silanol groups on the metal-support interactions in silica-supported cobalt Fischer-Tropsch catalysts. A temperature programmed surface reaction, *Journal of Catalysis* **2020** *381*, 121.