



RHODES UNIVERSITY, GRAHAMSTOWN, SOUTH AFRICA

STAFF INFORMATION



DR PHILANI MASHAZI
DEPUTY DIRECTOR

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Rhodes University, Makhanda, 6140, SOUTH AFRICA.

EDUCATION DETAILS:

Phd (Chemistry) 2012 - Rhodes University, Grahamstown, South Africa

MSc (Chemistry with distinction) 2007 - Rhodes University, Grahamstown, South Africa

BScH 2004 - Rhodes University, Grahamstown, South Africa

BSc 2003 - Rhodes University, Grahamstown, South Africa

EMPLOYMENT HISTORY:

CURRENT:

Deputy Director

Rhodes/DST Institute for Nanotechnology Innovation, Rhodes University, Grahamstown

Lecturer (Analytical and Inorganic Chemistry)

Chemistry Department, Rhodes University, Grahamstown

Dr Mashazi, spent 7 years at the Council for Minerals Technology (Mintek) as a research scientist from February 2007 to September 2013. During his tenure at Mintek, Dr Mashazi studied his doctoral degree part-time and graduated with the Doctor of Philosophy (PhD) degree at Rhodes University in April 2012. He joined Rhodes University Chemistry Department as a Senior Lecturer of Inorganic Chemistry since October 2013. He is currently involved in many departmental activities whilst pursuing his research interests. He further provides support to the National Facility funded by the Department of Science and Technology, the Institute for Nanotechnology Innovation. He manages two state-of-the-art equipments, that is the X-ray photoelectron spectroscopy (XPS) and the TOF-SIMS (Time-of-flight Secondary Ion Mass Spectrometry). Both these techniques are a very sensitive surface analytical techniques well established for many industrial and research applications.

TEACHING 2013 - Present

- 1st Year – Kinetics and Electrochemistry
- 2nd Year – Kinetics and Electroanalytical Techniques
- 3rd Year – Crystallography (2013 – 2018)
- Honours - Intelligent Nanomaterials and Their Applications, Design and Development of Biosensors

RESEARCH INTEREST:

- Design of nanomaterials with intrinsic peroxidase- or catalase-like properties for biosensor applications.
- Surface chemical characterization of immobilized electrocatalytic N4-macrocycle metal complexes for electrochemical sensing.
- Nanofabrication of electrode surfaces for enhanced electrocatalytic applications and detection of biomedical molecules.
- Design of methods for disease biomarker detection using electrochemical and optical biosensors: biomarkers for communicable and non-communicable diseases.
- Investigation of methods of integrating biological molecules with nanostructured materials for the design of highly sensitive and selective novel sensors and/or biosensors.
- Design of immunochromatographic lateral-flow systems integrating electrochemical signal generation for diagnostic applications.
- Investigating N4-macrocycle metal complexes and their nanomaterials conjugates as potential dyes for the fabrication dye-sensitized solar cells.

PUBLICATIONS:

2020 Publications:

1. Francis Chindeka, **Philani Mashazi**, Jonathan Britton, David O. Oluwole, Sivuyisile Mapukata, Tebello Nyokong, **Fabrication of de-sensitized solar cells based on push-pull asymmetrical substituted zinc and copper phthalocyanines and reduced raphene oxide nanosheets**. Journal of Photochemistry & Photobiology A: Chemistry 399 (2020) 112612. <https://doi.org/10.1016/j.jphotochem.2020.112612>
2. Nqobile Njoko, Marcel Louzada, Jonathan Britton, Samson Khene, Tebello Nyokong, **Philani Mashazi***, **Bioelectrocatalysis and surface analysis of gold coated with nickel oxide/hydroxide and glucose oxidase towards detection of glucose**. Colloids and Surfaces B: Biointerfaces, 2020 (190) 110981. <https://doi.org/10.1016/j.colsurfb.2020.110981>
3. Omotayo Adeniyi, Simboghile Sicwetsha, **Philani Mashazi**, **Nanomagnet-silica nanoparticles decorated with Au@Pd for enhanced peroxidase-like activity and colorimetric glucose sensing**. ACS Applied Materials & Interfaces, 2020 (12) 1973 - 1987. <http://pubs.acs.org/doi/abs/10.1021/acsami.9b15123>
4. Omotayo Adeniyi, **Philani Mashazi**, **Stable thin films of human P53 antigen on gold surface for the detection of tumour associated anti-P53 autoantibodies**, Electrochimica Acta, 2020 (331) 135272 <https://doi.org/10.1016/j.electacta.2019.135272>
5. Keamogetse Tshenkeng, **Philani Mashazi**, **Covalent attachment of cobalt (II) tetra-(3-carboxyphenoxy) phthalocyanine onto pre-grafted gold electrode for the determination of catecholamine neurotransmitters** Electrochimica Acta 360 (2020) 137015 <https://doi.org/10.1016/j.electacta.2020.137015>

Older:

6. Sixberth Mlowe, Ginena B. Shombe, Matthew P. Akerman, Egid B. Mubofu, Paul O'Brien, **Philani Mashazi**, Tebello Nyokong, Neerish Revaprasadu, **Morphological influence of deposition routes on lead sulphide thin films**, Inorganica Chimica Acta, 2019 (498) 119116. <https://doi.org/10.1016/j.ica.2019.119116>
7. Charles Gervas, Malik Dilshan Khan, Sixberth Mlowe, Chunyang Zhang, Chen Zhao, Ram K. Gupta, Matthew P. Akerman, **Philani Mashazi**, Tebello Nyokong, **Philani Mashazi**, Neerish Revaprasadu, **Synthesis of off-stoichiometry CoS nanoplates from molecular precursor for efficient H₂/O₂ evolution and super-capacitance**, ChemElectroChem, 2019 (6) 2560 - 2569. <https://doi.org/10.1002/celec.201900413>
8. Zainab O Makinde, **Philani Mashazi**, Samson Khene, **Electrocatalytic behavior of single-walled carbon nanotubes with alkythio-substituted cobalt binuclear phthalocyanines towards oxidation of 4-chlorophenols**, Journal of Porphyrins and

Phthalocyanines, 2019 (23) 142 - 153. <https://doi.org/10.1142/S1088424619500172>

9. Sindisiwe Mvango, **Philani Mashazi**, **Synthesis, characterization of copper oxide-gold nanoalloys and their peroxidase-like activity towards colorimetric detection of glucose**, Materials Science and Engineering C, 2019 (96) 814 - 823. <https://doi.org/10.1016/j.msec.2018.12.010>
10. Francis Chindeka, **Philani Mashazi**, Jonathan Britton, Gertrude Fomo, David O. Oluwole, Azole Sindelo, Tebello Nyokong, **Optimizing phthalocyanine based dye-sensitized solar cells: the role of reduced graphene oxide**, Synthetic Metals 2018 (246) 236 - 245. <https://doi.org/10.1016/j.synthmet.2018.10.021>.
11. Daniel Mwanza, Marcel Louzada, Jonathan Britton, Tebello Nyokong, Samson Khene, **Philani Mashazi**, **The effect of the cobalt and manganese central metal ions on the non-linear optical properties of tetra(4-propargyloxyphenoxy) phthalocyanines**, New Journal of Chemistry, 2018 (42) 9857 - 9864. <https://doi.org/10.1039/c8nj00748a>.
12. Daniel Mwanza, Sindisiwe Mvango, Samson Khene, Tebello Nyokong, **Philani Mashazi**, **Exploiting click chemistry for the covalent immobilization of tetra (4-propargyloxyphenoxy) metallophthalocyanines onto prehyalazide grafted gold surfaces**, Electrochimica Acta, 254 (2017) 89 – 100. <https://doi.org/10.1016/j.electacta.2017.09.115>.
13. Zainab O. Makinde, Marcel Louzada, **Philani Mashazi**, Tebello Nyokong, Samson Khene, **Electrocatalytic behaviour surface of confined pentanethio cobalt (II) binuclear phthalocyanines towards the oxidation of 4-chlorophenol**, Applied Surface Science, 425 (2017) 702–712. <http://dx.doi.org/doi:10.1016/j.apsusc.2017.06.271>.
14. Daniel Mwanza, Samson Khene, **Philani Mashazi**, **Tetra (4-propargyloxyphenoxy) phthalocyanines: facile synthesis, fluorescence and thermal properties**, Polyhedron, 134 (2017) 263–274, <http://dx.doi.org/10.1016/j.poly.2017.06.029>.
15. Sandile S. Gwebu, Philiswa N. Nomngongo, **Philani N Mashazi**, Tebello Nyokong, Nobanathi Maxakato, **Platinum Nanoparticles Supported on Carbon Nanodots as Anode Catalysts for Direct Alcohol Fuel Cells**, *Int. J. Electrochem. Sci.*, 12 (2017) 6365 – 6378, <http://dx.doi.org/10.20964/2017.07.09>.
16. Siphesihle Robin Nxele, **Philani Mashazi**, Tebello Nyokong, **Surface functionalization of glassy carbon electrodes via adsorption, electrografting and click chemistry using quantum dots and alkynyl substituted phthalocyanines: a brief review**, *Proceedings SPIE*, V10036 (2017) 100360D, Fourth Conference on Sensors, MEMS, and Electro-Optic Systems. <http://dx.doi.org/10.1117/12.2245687>.
17. Mbuso Mlambo, Richard A. Harris, **Philani Mashazi**, Myalowenkosi Sabela, Suvardhan Kanchi, Lawrence M. Madikizela, Prince N. Shumbula, Nosipho Moloto, Thulani T. Hlatshwayo, Phumlani S. Mdluli, **Computational and experimental evaluation of selective substitution of thiolated coumarin derivatives on gold nanoparticles: surface enhancing Raman scattering and electrochemical studies**, Applied Surface Science 396 (2017) 695 - 704. <http://dx.doi.org/10.1016/j.apsusc.2016.11.011>.
18. Donovan M. Mafukidze, **Philani Mashazi**, Tebello Nyokong, **Synthesis and singlet oxygen production by a phthalocyanine when embedded in asymmetric polymer membranes**, Polymer 105 (2016) 203 - 213. <http://dx.doi.org/10.1016/j.polymer.2016.10.032>.

19. Olawale L. Osifeko, Imran Uddin, **Philani N. Mashazi**, Tebello Nyokong, **Physicochemical and antimicrobial photodynamic chemotherapy of unsymmetrical indium phthalocyanines alone on in the presence of magnetic nanoparticles**, *New Journal of Chemistry*, 2016 (40) 2710 - 2721. <http://dx.doi.org/10.1039/c5nj01922b>.
20. Stephen Nyoni, **Philani Mashazi**, Tebello Nyokong, **Electrode modification using nanocomposites of electropolymerised cobalt phthalocyanines supported on multi-walled carbon nanotubes**, *Journal of Solid State Electrochemical*, 2016 (20) 1075 – 1086. <http://dx.doi.org/10.1007/s10008-015-2985-6>.
21. Oluwasesan Adegoke, **Philani Mashazi**, Tebello Nyokong, Patricia B.C. Forbes, **Fluorescence properties of alloyed ZnSeS quantum dots overcoated with ZnTe and ZnTe/ZnS shells**, *Optical Materials*, 2016 (54) 104 - 110. <http://dx.doi.org/10.1016/j.optmat.2016.02.024>.
22. Munyaradzi Shumba, **Philani Mashazi**, Tebello Nyokong **“Turn on” fluorescence enhancement of Zn octacarboxy phthaloyanine-Graphene Oxide Conjugates by hydrogen peroxide**. *Journal of Luminescence*, 2016 (170) 317-324. <http://dx.doi.org/10.1016/j.jlumin.2015.11.001>.
23. Sihle Nxele, **Philani Mashazi**, Tebello Nyokong, **Construction of a Hydrazine Sensor using an Alkynyl Tetra-Substituted Fe(II) Phthalocyanine via Electrografting and Click Chemistry**, *Electroanalysis*, 2015 (27) 2468-2478. <http://dx.doi.org/10.1002/elan.201500212>.
24. Sarah D’Souza, **Philani Mashazi**, Jonathan Britton, Tebello Nyokong, **Effects of differently shaped silver nanoparticles on the photophysics of mercaptopyridine-substituted phthalocyanines**, *Polyhedron*, 2015 (99) 112–121. <http://dx.doi.org/10.1016/j.poly.2015.06.038>.
25. David Oluwole, Jonathan Britton, **Philani Mashazi**, Tebello Nyokong, **'Synthesis and photophysical properties of nanocomposites of aluminum tetrasulfonated phthalocyanine covalently linked to glutathione capped CdTe/CdS/ZnS quantum dots**, *Synthetic Metals*, 2015 (205) 212-221. <http://dx.doi.org/10.1016/j.synthmet.2015.04.015>.
26. Racheal Ogbodu, Edith Amuhaya, **Philani Mashazi**, Tebello Nyokong, **Photophysical Properties of Zinc Phthalocyanine-Uridine Single Walled Carbon Nanotube – conjugates**, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 2015(149) 231-239. <http://dx.doi.org/10.1016/j.saa.2015.04.040>.
27. Stephen Nyoni, **Philani Mashazi**, Tebello Nyokong, **Iodine-Doped Cobalt Phthalocyanine Supported on Multiwalled Carbon Nanotubes for Electrocatalysis of Oxygen Reduction Reaction**, *Electroanalysis*, 2015 (27) 1176-1187. <http://dx.doi.org/10.1002/elan.201400499>.
28. Audacity Maringa, **Philani Mashazi**, Tebello Nyokong, **Electrocatalytic activity of bimetallic Au-Pd nanoparticles in the presence of cobalt tetra-amino phthalocyanine**, *Journal of Colloidal and Interface Science* 2015 (440) 151–161. <http://dx.doi.org/10.1016/j.jcis.2014.10.056>.

29. Audacity Maringa, **Philani Mashazi**, Tebello Nyokong, **Characterization of electrodes modified by one-pot or step-by-step electro-click reaction and axial ligation of iron tetra-carboxy phthalocyanine**, *Electrochimica Acta*, 2014 (**145**) 237 - 244.
<http://dx.doi.org/10.1016/j.electacta.2014.09.011>.
30. **Philani Mashazi****, Sibulelo Vilakazi, Tebello Nyokong, **Design and evaluation of an electrochemical immunosensor for measles serodiagnosis using measles-specific Immunoglobulin G antibodies**, *Talanta*, 2013 (**115**) 694 – 701.
<http://dx.doi.org/10.1016/j.talanta.2013.06.036>.
31. Mbuso Mlambo, Siyasanga Mpelane, Phumlani Mdluli, **Philani Mashazi**, Lucky Sikhwivhilu, Nosipho Moloto and Makwena Moloto, **Unique flexible silver dendrites thin films fabricated on cellulose dialysis cassettes**, *Journal of Material Science*, 2013 (**48**) 6418 - 6425.
<http://dx.doi.org/10.1007/s10853-013-7442-2>.
32. **Philani Mashazi****, Phumlani Tetyana, Sibulelo Vilakazi and Tebello Nyokong, **Electrochemical impedimetric immunosensor for the detection of measles-specific IgG antibodies after measles infections**, *Biosensors and Bioelectronics*, 2013 (**49**) 32 - 38.
<http://dx.doi.org/10.1016/j.bios.2013.04.028>.
33. **Philani N. Mashazi****, Nolwazi Nombona, Munkombwe Muchindu and Sibulelo Vilakazi, **metallophthalocyanines and metalloporphyrins as electrocatalysts: a case of hydrogen peroxide and glucose detection**, *Journal of Porphyrins and Phthalocyanines*, 2012 (**16**) 741 - 753. <http://dx.doi.org/10.1142/S1088424612300066>.
34. Ndabenhle M. Sosibo, Phumlani S. Mdluli, **Philani N. Mashazi****, Robert T. Tshikhudo, Amanda Skepu, Sibulelo Vilakazi and Tebello Nyokong, **Facile Deposition of Gold Nanoparticle Thin Films on Semi-Permeable Cellulose Substrate**, *Material Letters*, 2012 (**88**) 132 - 135. <http://dx.doi.org/10.1016/j.matlet.2012.08.043>.
35. Ndabenhle M. Sosibo, Phumlani S. Mdluli, **Philani N. Mashazi**, Busiswa Dyan, Tebello Nyokong, Robert T. Tshikhudo, Amanda Skepu and Elma van der Lingen, **Synthesis, Density Functional Theory, Molecular Dynamics and Electrochemical Studies of 3-Thiopheneacetic Acid-Capped Gold Nanoparticles**, *Journal of Molecular Structure*, 2011 (**1006**) 494 - 501. <http://dx.doi.org/10.1016/j.molstruc.2011.09.057>.
36. Phumlani S. Mdluli, Ndabenhle M. Sosibo, **Philani N. Mashazi**, Tebello Nyokong, Robert T. Tshikhudo, Amanda Skepu and Elma van der Lingen, **Selective Adsorption of PVP on the Surface of Silver Nanoparticles: A Molecular Dynamics Study**, *Journal of Molecular Structure*, 2011 (**1004**) 131 – 137. <http://dx.doi.org/10.1016/j.molstruc.2011.07.049>
37. **Philani Mashazi**, Tawanda Mugadza, Ndabenhle Sosibo, Phumlani Mdluli, Sibulelo Vilakazi and Tebello Nyokong , **The effects of carbon nanotubes on the electrocatalysis of hydrogen peroxide by metallo-phthalocyanines**. *Talanta*, 2011 (**85**) 2202 - 2211.
<http://dx.doi.org/10.1016/j.talanta.2011.07.069>.
38. **Philani Mashazi**; Chamunorwa Togo, Janice Limson, Tebello Nyokong, **Applications of polymerized metal tetra-amino phthalocyanines towards hydrogen peroxide detection**,

Journal of Porphyrins and Phthalocyanines, 2010 (14) 252-263.

<http://dx.doi.org/10.1142/S1088424610001994>.

39. **Philani Mashazi, Tebello Nyokong, Electrocatalytic studies of covalently immobilized metal tetra-amino phthalocyanines onto derivatized screen-printed gold electrodes**, Microchimica Acta, 2010, (171) 321-332. <http://dx.doi.org/10.1007/s00604-010-0438-6>.
40. **Philani Mashazi, Edith Antunes, Tebello Nyokong, Probing electrochemical and electrocatalytic properties of cobalt(II) and manganese(III) octakis(hexylthio)phthalocyanine as self-assembled monolayers**, Journal of Porphyrins and Phthalocyanines, 2010 (14) 932-947. <http://dx.doi.org/10.1142/S108842461000277X>.
41. Ronen Fogel, **Philani Mashazi, Tebello Nyokong, Janice Limson, Critical assessment of the Quartz Crystal Microbalance with Dissipation as an analytical tool for biosensor development and fundamental studies: Metallophthalocyanine-?glucose oxidase biocomposite sensors**, Biosensors & Bioelectronics (2007), 23(1), 95-101. <http://dx.doi.org/10.1016/j.bios.2007.03.012>.
42. **Philani N. Mashazi, Philippe Westbroek, Kenneth I. Ozoemena, Tebello Nyokong, Surface chemistry and electrocatalytic behavior of tetra-carboxy substituted iron, cobalt and manganese phthalocyanine self-assembled monolayers on gold electrode**, Electrochimica Acta, 2007 (53) 1858-1869. <http://dx.doi.org/10.1016/j.electacta.2007.08.044>.
43. **Philani N. Mashazi, Kenneth I. Ozoemena, Tebello Nyokong, Tetracarboxylic acid cobalt phthalocyanine SAM on gold: Potential applications as amperometric sensor for H₂O₂ and fabrication of glucose biosensor**, Electrochimica Acta, 2006 (52) 177-186. <http://dx.doi.org/10.1016/j.electacta.2006.04.056>.
44. **Philani N. Mashazi, Kenneth I. Ozoemena, David M. Maree, Tebello Nyokong, Self-assembled monolayers (SAMs) of cobalt tetra-carboxylic acid chloride phthalocyanine covalently attached onto a preformed mercaptoethanol SAM: A novel method**, Electrochimica Acta, 2006 (51) 3489-3494. <http://dx.doi.org/10.1016/j.electacta.2005.10.004>.