



RHODES UNIVERSITY, GRAHAMSTOWN, SOUTH AFRICA
STAFF INFORMATION



DR BRIDGET MUTUMA
Post-Doctoral Fellow

CONTACT DETAILS:

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EDUCATION DETAILS:

PhD (Chemistry) – 2016 – University of Witwatersrand, Johannesburg, South Africa

MSc (Material Science and Engineering) -2013- Kangwon National University, South Korea

Korean Language course-2011- Hallym University, Chuncheon, South Korea

BSc (Analytical Chemistry)- 2009 – Kenyatta University, Nairobi, Kenya

EMPLOYMENT HISTORY:

2017-2019

Postdoctoral research fellow, University of Pretoria, South Africa

2014- 2017

Tutor/Laboratory demonstrator/Mentor, University of Witwatersrand, South Africa

03/2010 – 08/2010

Quality Control Supervisor, Mastermind Limited, Kenya

07/2008 – 09/2008

Research Assistant, Kenya Bureau of Standards, Kenya

RESEARCH TITLE/PROJECT:

Heteroatom-doped core-shell nanostructures for application in sensors

PUBLICATIONS:

1. Tarimo, Delvina Japhet, Kabir O. Oyedotun, Abdulmajid A. Mirghni, **Bridget Mutuma**, Ndeye Fatou Sylla, Phathutshedzo Murovhi, and Ncholu Manyala. "Enhanced electrochemical performance of supercapattery derived from sulphur-reduced graphene oxide/cobalt oxide composite and activated carbon from peanut shells." *International Journal of Hydrogen Energy* (2020).
<https://doi.org/10.1016/j.ijhydene.2020.09.142>
2. Balla Ngom, Maty Ndiaye, Fatou S. Ndeye, **Bridget K. Mutuma** and Ncholu Manyala "Sustainable development of vanadium pentoxide carbon composites derived from Hibiscus sabdariffa family for application in supercapacitors", *Sustainable Energy & Fuels* **4**, no. 9 (2020), 4814-4830
<https://doi.org/10.1039/D0SE00779J>
3. Nicholas Musyoka, **Bridget K. Mutuma** and Ncholu Manyala "Onion-derived Activated Carbons with Enhanced Surface Area for Improved Hydrogen Storage and Electrochemical Energy Application", *RSC Advances*, **10**, (2020), 26928-26936
<https://doi.org/10.1039/D0RA04556J>
4. Andrew. M. Hank, Cuthbert. Nyamupangedengu, **Bridget. K. Mutuma**, Hu Li, Neil. J. Coville, K. Leifer and Iakovos Sigalas "Comparative Characterisation of CNS/Epoxy and BN/Epoxy Nanodielectrics using Electrical Tree PD Measurements and Atomic Force Microscopy", *International Journal of Engineering Research in Africa*, vol. 48, (2020) pp. 24-37
<https://doi.org/10.4028/www.scientific.net/JERA.48.24>
5. Federico Poli, Damilola Momodu, Giovanni Emanuele Spina, Antonio Terella, **Bridget K. Mutuma**, Maria Letizia Focarete, Ncholu Manyala and Francesca Soavi "Pullulan-ionic liquid supercapacitor; a novel, smart combination of green components for an easy to recycle device; *Electrochimica Acta*, (2020), 135872
<https://doi.org/10.1016/j.electacta.2020.135872>
6. Kabir Oyedotun, Tshifhiwa Masikhwa, Abdulmajid Mirghni, **Bridget K. Mutuma** and Ncholu Manyala "Electrochemical properties of asymmetric supercapacitor based on optimized carbon-based nickel-cobalt-manganese ternary hydroxide and sulphur-doped carbonized iron-polyaniline electrodes", *Electrochimica Acta*, (2020), 135610
<https://doi.org/10.1016/j.electacta.2020.135610>
7. Fatou S. Ndeye, Maty Ndiaye, Balla Ngom, **Bridget K. Mutuma**, Damilola Momodu, Mohamed Chaker, and Ncholu Manyala. "Ex-situ nitrogen-doped porous carbons as electrode materials for high performance supercapacitor", *Journal of Colloid and Interface Science* **569** (2020), 332-345
<https://doi.org/10.1016/j.jcis.2020.02.061>
8. Maty Ndiaye, Fatou S. Ndeye, Balla Ngom, **Bridget K. Mutuma**, Julian Dangbegnon, Sekhar Ray and Ncholu Manyala "Nitridation temperature effect on carbon vanadium oxynitrides for a symmetric supercapacitor", *Nanomaterials*, **9** (2019), 1762
<https://doi.org/10.3390/nano9121762>
9. Fatou S. Ndeye, Maty Ndiaye, Balla Ngom, Damilola Momodu, Jack Madito, **Bridget K. Mutuma** and Ncholu Manyala "Effect of porosity enhancing agents on the electrochemical performance of high-energy ultracapacitor electrodes derived from peanut shell waste", *Scientific reports* **9** (2019), 13673
<https://doi.org/10.1038/s41598-019-50189-x>

10. Lebogang R. Mosiane, Boitumelo J. Matsoso, Annah Makhongoana, **Bridget K. Mutuma**, Thomas H. Mongwe, Neil J. Coville and Manoko S. Maubane "Tuning the properties of CVD-grown multiwalled carbon nanotubes by ex-situ co-doping with boron and nitrogen heteroatoms", *Journal of Nanoparticle Research*, **21**, (2019), 207
<https://doi.org/10.1007/s11051-019-4654-7>
11. **Bridget K. Mutuma**, Clara I. Garcia-Martinez, Rodrigo C. Dias, Boitumelo Matsoso, Ivo A. Hümmelgen and Neil J. Coville "Nitrogen-doped hollow carbon spheres as chemical vapour sensors", *New Journal of Chemistry*, **43**, (2019), 8418-8427. *Featured in the front cover.*
<https://doi.org/10.1039/C9NJ00628A>
12. **Bridget K. Mutuma**, Boitumelo J. Matsoso, Damilola Momodu, Kabir O. Oyedotun, Neil J. Coville and Ncholu Manyala "Deciphering the structural, textural and electrochemical properties of activated BN-doped spherical carbons", *Nanomaterials*, **9**, (2019), 446
<https://doi.org/10.3390/nano9030446>
13. Damilola Momodu, Ndeye Fatou Sylla, **Bridget K. Mutuma**, Abdulhakeem Bello, Tshifhiwa Masikhwa, Simon Lindberg, Aleksandar Matic and Ncholu Manyala "Stable ionic-liquid-based symmetric supercapacitors from Capsicum seed-porous carbons", *Journal of Electroanalytical Chemistry Volume 838*, (2019), Pages 119-128
<https://doi.org/10.1016/j.jelechem.2019.02.045>
14. **Bridget K. Mutuma**, Kamalakannan Ranganathan, Boitumelo J. Matsoso, Daniel Wamwangi, Jonathan M. Keartland and Neil J. Coville "Effect of Gold Nanospheres and Nanodots on the Performance of PEDOT:PSS Solar Cells", *J. Nanoscience and Nanotechnology*. **19**, (2019), 2747–2754
<https://doi.org/10.1166/jnn.2019.15821>
15. Boitumelo Matsoso, **Bridget K. Mutuma**, Caren Billing, Kamalakannan Ranganathan, Tsenolo Lerotholi, Glenn Jones and Neil J. Coville "Investigating the electrochemical behaviour and detection of uric acid on ITO electrodes modified with differently doped N-graphene films", *Journal of Electroanalytical Chemistry, Volume 833*, (2019), Pages 160-168
<https://doi.org/10.1016/j.jelechem.2018.11.040>
16. Mongwe, Thomas H., Boitumelo J. Matsoso, **Bridget K. Mutuma**, Neil J. Coville, and Manoko S. Maubane. "Synthesis of chain-like carbon nano-onions by a flame assisted pyrolysis technique using different collecting plates." *Diamond and Related Materials* **90** (2018), 135-143
<https://doi.org/10.1016/j.diamond.2018.10.002>
17. Boitumelo Matsoso, **Bridget K. Mutuma**, Caren Billing, Kamalakannan Ranganathan, , Tsenolo Lerotholi, Glenn Jones and Neil J. Coville "The effect of N-configurations on selective detection of dopamine in the presence of uric and ascorbic acids using surfactant free N-graphene modified ITO electrodes", *Electrochimica Acta* **286**, (2018), 29-38
<https://doi.org/10.1016/j.electacta.2018.08.017>
18. Moritz Wolf, **Bridget K. Mutuma**, Neil J. Coville, Nico Fischer, and Michael Claeys, "The role of CO in the water-induced formation of cobalt oxide in a high conversion Fischer-Tropsch environment", *ACS Catalysis*, **8**, (2018), 3985-3989
<https://doi.org/10.1021/acscatal.7b04177>
19. Boitumelo Matsoso, Kamalakannan Ranganathan, **Bridget K. Mutuma**, Tsenolo Lerotholi, Glenn Jones and Neil J. Coville "Synthesis and characterization of boron carbon oxynitride films with tunable composition using methane, boric acid and ammonia", *New Journal of Chemistry*, **41**, (2017), 9497-9504
<https://doi.org/10.1039/C7NJ01886J>
20. **Bridget K. Mutuma**, Boitumelo J. Matsoso, Kamalakannan Ranganathan, Daniel Wamwangi, Jonathan M. Keartland and Neil J. Coville "Generation of radical species from CVD grown pristine and N-doped solid carbon spheres using H₂ and Ar as carrier gases", *RSC Advances*, **7**, (2017), 21187-21195
<https://doi.org/10.1039/C7RA03142D>

21. Francis Otieno, **Bridget K. Mutuma**, Kamalakannan Ranganathan, Mildred Airo, Rudolph Erasmus, Neil Coville and Daniel Wamwangi "Enhancement of organic photovoltaic device performance via P3HT:PCBM solution heat treatment", *Thin solid films*, **625**, (2017): 62-69
<https://doi.org/10.1016/j.tsf.2017.01.047>
22. Boitumelo Matsoso, Kamalakannan Ranganathan, **Bridget K. Mutuma**, Tsenolo Lerotholi, Glenn Jones and Neil J. Coville "Single-step synthesis of crystalline h-BN quantum-and nanodots embedded in boron carbon nitride films", *Nanotechnology*, *IOP*, **28**, (2017), 105602
<https://doi.org/10.1088/1361-6528/aa56df>
23. **Bridget K. Mutuma**, Rafael Rodrigues, Kamalakannan Ranganathan, Boitumelo Matsoso, Daniel Wamwangi, Ivo A. Hümmelgen and Neil J. Coville "Hollow carbon spheres and hollow carbon sphere/polyvinylpyrrolidone composite as ammonia sensors", *Journal of Materials Chemistry A*, **5**, (2017), 2539-2549. *This work is featured in the Inside front cover and under the Journal of Materials Chemistry A HOT papers themed collection 2016.*
<https://doi.org/10.1039/C6TA09424D>
24. Boitumelo Matsoso, Kamalakannan Ranganathan, **Bridget K. Mutuma**, Tsenolo Lerotholi, Glenn Jones and Neil J. Coville "Time-dependent evolution of the nitrogen configuration in N-doped graphene films", *RSC Advances*, **6** (2016), 106914-106920
<https://doi.org/10.1039/C6RA24094A>
25. **Bridget K. Mutuma**, Boitumelo Matsoso, Kamalakannan Ranganathan, Daniel Wamwangi and Neil J. Coville "Generation of open ended, worm like and graphene like structures from layered spherical carbon materials", *RSC Advances* **6**, (2016), 20399-20408
<https://doi.org/10.1039/C5RA25880D>
26. **Bridget K. Mutuma**, Godlisten N. Shao, Won Duck Kim, Hee Taik Kim, "Sol-gel synthesis of mesoporous anatase-brookite and anatase-brookite-rutile TiO₂ nanoparticles and their photocatalytic properties", *Journal of Colloid and Interface Science*, (2015), **442**, 1-7
<https://doi.org/10.1016/j.jcis.2014.11.060>

CONFERENCES/WORKSHOPS:

- 1) "Deciphering the structural, textural and electrochemical properties of activated BN-doped spherical carbons", **Oral presentation. Carbon Conference, Kentucky, USA. 12th-17th July 2019**
- 2) "The structural and electrochemical properties of onion-like carbon nanostructures", **Oral presentation. 69th meeting of the International Society of Electrochemistry 2018 Conference, Bologna, Italy. 1st – 7th September 2018**
- 3) "The structural and electrochemical properties of onion-like carbon nanostructures", **Oral presentation. NanoAfrica 2018 Conference, Durban, South Africa. 22nd – 25th April 2018**
- 4) "Hollow Carbon Spheres and a Hollow Carbon Sphere/Polyvinylpyrrolidone composite as Ammonia Sensors", **Oral presentation. African Energy Materials Conference, CSIR Convention, Pretoria, South Africa. 28th – 31st March 2017**
- 5) "Hollow carbon spheres as ammonia sensors", **Oral Presentation. Catalysis Society of South Africa (CATSA 2016). University of Johannesburg, Central Drakensberg. South Africa. 06th – 9th November 2016**
- 6) A Novel Synthesis Route of Broken, Deformed and Bubble-like Hollow Carbon Nanostructures from SiO₂@Polyvinylpyrrolidone Spheres as Templates" **Poster Presentation. Centre of excellence in Strong Materials (CoE-SM) Annual Workshop. University of Witwatersrand, Johannesburg. 26th May 2016**
- 7) "Generation of open ended, worm-like and graphene-like structures from spherical carbon materials" **Oral presentation. 6th International Conference in Nanoscience and Nanotechnology (NanoAfrica). University of South Africa (UNISA) Florida Campus, 03rd - 6th April 2016. Won 1st Prize Oral presentation PhD category**

- 8) "Synthesis of layered graphene like structures from spherical carbon materials" Oral presentation. 7th Wits Cross Faculty Symposium. Wits professional hub, Johannesburg, 01st - 2nd March 2016. Won 3rd Prize Oral presentation in the Faculty of Science**
- 9) "Synthesis and Characterization of Au nanoparticles and Au@Hollow Carbon Spheres for Application in Organic Solar Cells" Poster Presentation. Carbon 2015 Conference. Dresden, Germany, 12th July - 17th July 2015**
- 10) "Comparative investigation of the photocatalytic properties of anatase-brookite and anatase-rutile TiO₂ nanoparticles" Poster presentation. NanoAfrica 2014 International Conference. Vaalberjipark, Johannesburg, 30th March - 2nd April 2014**

AWARDS:

7th December 2019: American Chemical Society (ACS) PITTCON travel grant as a delegate to attend the PITTCON conference in Analytical Chemistry and Applied Spectroscopy in Chicago, USA

6th April 2016: 1st Prize Oral presentation PhD category. International Conference in Nanoscience and Nanotechnology (NanoAfrica). University of South Africa (UNISA), Florida Campus, South Africa

3rd March 2016: 3rd Prize Oral Presentation in the Faculty of Science. 7th Wits Cross Faculty Symposium. Professional Hub, University of Witwatersrand, South Africa

2015: Penny Huddle Award for the Best Undergraduate student teaching assistant, University of Witwatersrand, South Africa

2014 to 2016: Postgraduate Merit Award, University of Witwatersrand, South Africa

January 2013: Woosung Foundation Education Award, South Korea

February 2011: Best Korean Language (intermediate level) student Award, Hallym University, South Korea

2010– 2013: Korean Government scholarship Award, South Korean Government