

DR. ELIZABETH NTHAMBI NDUNDA

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RESEARCH INTEREST

Synthesis of molecularly imprinted polymers (MIPs) for determination and remediation of environmental pollutants and synthesis of highly selective hybrid system consisting of multiwalled carbonnanotubes and MIPs for application as recognition elements in sensors towards ultra-trace level detection of environmental pollutants.

UNIVERSITY EDUCATION

Doctor of Natural Sciences (Chemistry, *magna cum laude*). 2016. Ulm University, Germany

Master of Science (Chemistry). 2010. University of Nairobi, Kenya

Bachelor of Science (Chemistry, First Class Honours). 2005. University of Nairobi, Kenya

EMPLOYMENT

Sept 2024 – Present: Senior Lecturer, Department of Physical Sciences, Machakos University, Kenya

Sept 2017 – August 2024: Lecturer, Department of Physical Sciences, Machakos University, Kenya

August 2011 - Nov 2011: Assistant Lecturer, Kenya Methodist University

March 2010 - June 2010: Part-Time Lecturer, University of Nairobi

ADMINISTRATIVE DUTIES AND MEMBERSHIP OF COMMITTEES

August 2018 - Present: Chairperson, Department of Physical Sciences

Nov 2022 – Present: Member of the Career Services Committee

Sept 2019 - Present: Member of the Public Complaints Committee

August 2018 - Sept 2019: Acting Chairperson, Public Complaints committee

July 2018 - August 2018: Deputy Director, Academic Quality Assurance

Sept 2017 - July 2018: Examinations/Timetabling Coordinator, Department of Biological Sciences, Machakos University, Kenya

PUBLICATIONS IN PEER-REVIEWED JOURNALS, BOOK CHAPTERS AND CONFERENCE PROCEEDINGS

(i) Journal Articles

1. Abisakhi Esitsakha, **Elizabeth N. Ndunda**, Veronica A. Okello. (2024). Physico-chemical, Microbiological, and Ion Assessment in Underground and Surface Water in Machakos County, Kenya. *Water, Air, & Soil Pollution*, 235, 174. <https://doi.org/10.1007/s11270-024-06973-1>

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https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=elizabeth+n+ndunda&oq=e

2. **Elizabeth N Ndunda**, Moses M. Mwanza. (2023). Towards miniaturized electrochemical sensors for monitoring of polychlorinated biphenyls. *Open Research Africa* 2023, 6:5. <https://doi.org/10.12688/openresafrika.13983.1>
3. HF EL-Sharif, S. Patel, **EN Ndunda** and SM Reddy. (2022). Electrochemical Detection of Dioctylphthalate using Molecularly Imprinted Polymers and Disposable Electrodes. *Analytica Chimica Acta*. 1196, 339547. <https://doi.org/10.1016/j.aca.2022.339547>
4. Moses M. Mwanza, **Elizabeth N. Ndunda**, Geoffrey O. Bosire, Vincent O. Nyamori and Bice S. Martincigh. (2021). Advances in sample pretreatment and detection of PCBs in the environment. *Journal of hazardous materials advances*, 4 (2021) 100028. DOI: [10.1016/j.hazadv.2021.100028](https://doi.org/10.1016/j.hazadv.2021.100028)
5. **Ndunda, E.N.** (2020). Molecularly imprinted polymers: a closer look at the control polymer used in determining the imprinting effect: a mini review. *Journal of Molecular Recognition*, 33(11), e2855. DOI:[10.1002/jmr.2855](https://doi.org/10.1002/jmr.2855)
6. **Ndunda, E. N** and Wandiga, S.O. (2020). Spatial and Temporal Trends of Polychlorinated Biphenyls in Water and Sediment from Nairobi River, Kenya. *Environmental monitoring and assessment*, 192(9), 600
7. **Ndunda, E. N.**, Madadi, V.O. Wandiga, S.O. (2018). Organochlorine pesticides residues in sediment and water from Nairobi River, Kenya: levels, distribution and ecological risk assessment. *Environmental Science and Pollution Research*, 25(34), 34510-34518
8. Madadi, V.O., Wandiga, S, O., **Ndunda, E. N.**, Mavuti, K. M. (2017). Organochlorine Pesticides Residues in Lake Naivasha Catchment Water. *IJSRSET*, 3(5), 139-147
9. **Ndunda, E. N.**, Mizaikoff, B. (2016). Synthesis of stationary phases that provide group recognition for polychlorinated biphenyls by porogenic fragment template imprinting. *Journal of separation science*, 39(5), 939 - 946.
10. **Ndunda, E. N.**, Mizaikoff, B. (2016). Molecularly imprinted polymers for the analysis and removal of polychlorinated aromatic compounds in the environment: a review. *Analyst*, 141(11), 3141 - 3156
11. **Ndunda, E. N.**, Madadi, V. O., Mizaikoff, B. (2015). An alternative clean-up column for the determination of polychlorinated biphenyls in solid matrices. *Environmental Science: Processes & Impacts*, 17(12), 2101 - 2109.
12. **Ndunda, E. N.**, Mizaikoff, B. (2015). Multi-walled carbon nanotubes: innovative sorbents for pre-concentration of polychlorinated biphenyls in aqueous environments. *Analytical Methods*, 7(19), 8034 - 8040.
13. **Ndunda, E. N.**, Mizaikoff, B. (2015). Front cover. *Anal. Methods*, 2015, 7, 7927-7928. DOI: [10.1039/C5AY90078F](https://doi.org/10.1039/C5AY90078F)

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(ii) Book Chapters

14. Veronica A. Okello, **Elizabeth N. Ndunda**, Abisakhi Esitsakha, Mercy Jeptoo (2023). Fluoridated Water, Effects and Green Removal Techniques, IntechOpen, DOI: 10.5772/intechopen.113717. <https://www.intechopen.com/online-first/88550>
15. Japheth M. Nzangya, **Elizabeth N. Ndunda**, Geoffrey O. Bosire, Bice S. Martincigh and Vincent O. Nyamori (2021). Polybrominated Diphenyl Ethers (PBDEs) as Emerging Environmental Pollutants: Advances in Sample Preparation and Detection Techniques, Emerging Contaminants, Aurel Nuro, IntechOpen, DOI: 10.5772/intechopen.93858. <https://www.intechopen.com/chapters/74152>

(iii) Conference proceedings

16. **Elizabeth Ndunda** & Moses Mwanza. (2021). Advances in Sensor Technology in Determination of Polychlorinated Biphenyls in the Environment. Proceedings of the 3rd Annual Machakos University International Conference held on 22nd– 25th June 2021, Machakos University, Kenya

CONFERENCE PRESENTATIONS

1. **E.N. Ndunda** and Moses Mwanza. (June 2023). Molecularly Imprinted Polymers for Pre-concentration and Detection of Polychlorinated Biphenyls. Meru University of Science and Technology's 2nd Annual International Research and Innovation Conference (MUSTIC 2023). Meru University of Science and Technology, Meru. Oral Presentation.
2. **E.N. Ndunda** and Moses Mwanza. (February 2023). *Molecularly Imprinted Polymers in Preconcentration and Fabrication of Electrochemical Sensor for Polychlorinated Biphenyls*. Meeting of Minds Conference and FLAIR Award Holders' Event. Poster presentation.
3. H.F. El-Sharif, S. Patel, **E. N. Ndunda**, S. M. Reddy (December 2022). *Electrochemical sensor for dioctyl phthalate based on molecularly imprinted polymer modified screen-printed electrodes*. 11th International Conference of the African Materials Research Society. University Cheikh Anta Diop of Dakar. Dakar. Senegal. Oral presentation.
4. **Ndunda, E. N.** (October 2021). *Recent Advances in Application of Molecularly Imprinted Polymers for Detection of Pollutants in Aquatic Environment*. The 6th Alexander Von-Humboldt-Kenya "Kollegs" Conference 2021. Kirinyaga University. Oral Presentation
5. **Ndunda, E. N** and Moses Mwanza (June 2021). *Advances in Sensor Technology in Determination of Polychlorinated Biphenyls in the Environment*. Machakos University 3rd Annual International Conference. Machakos University, Kenya. Oral Presentation.
6. Mwanza, M. M., **Ndunda, E. N**, Bosire G. O., Martincigh, Bice., Nyamori, V. (June 2021). *Fabrication of Molecularly Imprinted Polymers Based Sensor for Determination of Polychlorinated Biphenyls in The Environment*. Machakos University 3rd Annual International Conference. Machakos University, Kenya. Oral Presentation.
7. Nzangya, J. M., **Ndunda, E. N**, Bosire G. O., Martincigh, Bice., Nyamori, V. (June 2021). *Synthesis of Molecularly Imprinted Polymers and their Applications as Adsorbents in Sample Preconcentration in Determination of Polybrominated Diphenyl Ethers*. Machakos

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- University 3rd Annual International Conference. Machakos University, Kenya. Oral Presentation.
8. **Ndunda, E. N** (September 2019). *Molecularly imprinted polymers selective to polychlorinated biphenyls and their integration in QCM Sensors*. ANSO-MMU-SAJOREC International Conference. Maasai Mara University, Kenya. Oral Presentation.
 9. **Ndunda, E. N** (April 2018). *Molecular imprinting: Challenges and Future Prospects*. Machakos University 1st International Conference. Machakos University, Kenya. Oral presentation
 10. **Ndunda, E. N** and Mizaikoff, B (May 2017). “*Synthesis of molecularly imprinted polymers providing group recognition for Polychlorinated Biphenyls*”. 9th International Conference of the Kenya Chemical Society (KCS), United States International University-Africa (Kenya). Oral presentation.
 11. **Ndunda, E. N**, Madadi, V. O and Mizaikoff, B (August 2015). “*Composite-MISPE for the determination of PCBs in solid matrices*” 6th Graduate students’ symposium on molecular imprinting, University of Kent (UK). Oral presentation.
 12. **Ndunda, E. N** and Mizaikoff, B (March 2015). “*Multiwalled carbon nanotubes solid-phase extraction for the determination of six indicator PCBs in aqueous samples*”. ANAKON Conference. University of Graz (Austria). Poster presentation
 13. **Ndunda, E. N** and Mizaikoff, B (March 2015). “*Development of an extraction and clean-up method for rapid analysis of six indicator PCBs in soil, sediment, and water*”. 9. Deutsches Biosensor Symposium. TU München (Germany). Poster presentation
 14. **Ndunda, E. N** and Mizaikoff, B (August 2013). “*Molecularly imprinted solid phase extraction (MISPE) for endocrine disrupting compounds*”. 5th Graduate students’ symposium on molecular imprinting. Queen's University Belfast (UK). Oral presentation.
 15. **Ndunda, E. N** (July 2013). 63rd Lindau Nobel Laureate Meeting, Lindau, Germany. Participated as a young scientist.
 16. **Ndunda, E. N**, Wandiga, S. O and Shiundu, P. M (November 2009). “*Assessment of Polychlorinated Biphenyls (PCBs) in Sediments and Water from Nairobi River*”. Joint 4th Society of Environmental Toxicology and Chemistry (SETAC) Africa meeting and International Conference on Environmental Pollution and Toxicology. Kampala, Uganda. Oral presentation.
 17. **Ndunda, E. N**, Wandiga, S. O and Shiundu, P. M (October 2009) “*Assessment of Polychlorinated Biphenyls (PCBs) in Sediments and Water from Nairobi River*”. Joint 6th Kenya Chemical Society, East and Southern Africa Environmental Chemistry, and 8th Theoretical Chemistry in Africa Conference. Mombasa, Kenya. Oral presentation.

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WORKSHOPS & TRAININGS

- ISO 9001:2015 Quality management systems implementers training course (February 2024), Machakos University.
- Career Guidance and counselling capacity building training (May 2023). Machakos University
- Grant proposal writing (March 2019). University of Nairobi
- Grant proposal writing (March 2018). Machakos University.
- Scientific writing workshop (April 2015). Ulm University (Germany).
- Powerful presentation skills (October 2014). Ulm University (Germany).
- Training on contemporary mixture analysis using Gas Chromatography Mass spectrometer (GC-MS) (August 2011). Jomo Kenyatta University of Agriculture and Technology (Kenya).
- UNEP-GEF workshop on analysis of persistent organic pollutants in environmental samples (October 2010). University of Nairobi (Kenya).
- Summer school on risk assessment organized by the African Network for Chemical Analysis of Pesticides (October 2009). Makerere University (Uganda).
- “Field IT” for East Africa aimed at training young East African scientists in ecology and conservation through research camps in Lake Naivasha and Lake Natron (September & November 2009).
- Workshop on pesticides residue analysis, quality assurance and control, data analysis and report writing (April 2008). University of Nairobi (Kenya)

RESEARCH GRANTS AND SCHOLARSHIPS

- MksU internal grant 2023/2024 (PI) KES 699,200
- Erasmus + Programme Mobility Grant (Co-Researcher) €85,084, 2022
- Alexander Von Humboldt Foundation (Junior Researcher) €55,000, 2022
- MksU internal grant 2021/2022 (Co-PI) KES 692,960
- MksU internal grant 2021/2022 (Co-PI) KES 654,000
- Royal Society-Royal Society of Chemistry International Exchanges Grant (£ 6,000), 2020
- Future Leaders – African Independent Research (FLAIR) fellowship grant (£251,000 or KES 38 M), 2019
- Workplace Equipment Grant for Returning Experts by Centre for International Migration and Development (CIM) (€ 10, 000), 2018
- DAAD scholarship to pursue a Doctor of Natural Sciences at Ulm University, Germany, 2011
- DAAD scholarship to undertake German Language Course at Goethe Institut, Nairobi, Kenya & Mannheim, Germany, 2011
- University of Nairobi Scholarship to pursue a Master of Science in Chemistry, 2005

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SUPERVISION OF POSTGRADUATE STUDENTS

(i) Completed

1. October 2019 – 2023: Moses Mwanza Mutiso “Synthesis and characterization of Molecularly Imprinted Polymers for Preconcentration and Detection of Polychlorinated Biphenyls”: Graduated - 3rd May 2024.

(ii) Continuing

2. October 2019 - Present: Japheth Musili Nzangya “Synthesis of Molecularly Imprinted Polymers and their Application as Adsorbents in Sample Preconcentration Step during Determination of Polybrominated Diphenyl Ethers (PBDEs)”
3. November 2020 – Present: Benedict Muia “Fabrication of Electrochemical Sensor for the Determination of Polychlorinated Biphenyls in the Environment”
4. January 2021 – Present: Abisaki Esitsakha “Surfactant Modified Poly (Amic) Acid Nano-Enabled Filter Membrane For Perchlorate Ion Assessment In Water”
5. June 2022 – Present: Sharolyne Atiang’ “Effect of Simulated Rainfall and Natural Weather on Chromated Copper Arsenate Treated Wood and Environmental Remediation: A Focus on Wood Treatment Plants In Kenya
6. June 2022 – Present: Kimenye Nzuki “Graphenated Polypyrrole Nanocomposite for Determination of Poly Aromatic Hydrocarbons in Waste Water”

SUPERVISION OF UNDERGRADUATE STUDENTS

2024: Optimization of Bioethanol Production from Apple Pomace by Computational-Aided Simulation (Kenneth Kipkirui, Beatrice Gathoni, Dominic Njambi, Robert Okecha, & Elijah Moogi).

2023: Caffeine Content in Soft and Energy Drinks Sold in Machakos Town (Maxmilian Nyangoto, Mary Ogutu, Hesbon Muigai, & Gideon Kipchirchir).

2023: Determination of Selected Heavy Metals, Sulphur Dioxide, Invert Sugar and Moisture Content in Sugar (Kelvin Maseno, Kenneth Kipruto, Stacy Kanguha, Milly Chepngetich & Cyrus Muendo).

2022: Fermentative Bioethanol Production From Jackfruit Succulent in Selected Sites in Western Kenya (Evans Makero, Peter Nderitu, Deffler Chepngeno, Clinton Kiprotich & Daniel Kimwele).

2022: Levels of Heavy Metals in Borehole Water from Selected Boreholes in Machakos Town, Kenya (Kelvin Chepkonga, Jalex Wanyoike & Elvis Okumu).

JOURNAL ARTICLES AND PROPOSAL REVIEWER

1. Environmental Health Insights – “Ecotoxicological Assessment Of The Nairobi River- Athi River Basin: Status and Impact on Human Health”, 2024
2. Talanta – “Surface modification of PVDF ultrafiltration membranes using spacer arms and synthetic receptors for virus capturing and separation”, 2024

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3. Analyst – “Rapid Sub-nanomolar Protein Determination in Serum using Electropolymerized Molecularly Imprinted Polymers (EMIPs)”, 2023
4. Chromatographia – “Magnetic metal-organic framework material synthesized by molecular imprinting technology for detection of bisphenol A”, 2023
5. Clean Technologies and Environmental Policy – “Molecularly imprinted polymers toward herbicides - progress in development and the current state of the art - short review”, 2023
6. Talanta – “Preparation and Characterization of 96-well Microplates Coated with Molecularly Imprinted Polymer for Determination and Biosimilarity Assessment of Recombinant Human Erythropoietin”, 2020
7. AAS Open Research – “Synthesis of bismuth oxyhalide (BiOBr_zI_(1-z)) solid solutions for photodegradation of methylene dye”, 2021
8. African Journal of Pure and Applied Sciences – “Uptake of *p*-Nitrophenol (PNP) from model aqueous solutions using raw and quaternised *Afromomum melegueta* peels”, 2020
9. Analyst Journal – “Fluorescence Based Detection of Polychlorinated Biphenyls (PCBs) in Water using Hydrophobic Interaction”, 2017
10. Machakos University Internal Grant – “Graphenated polypyrrole nanocomposite for real-time detection of highly carcinogenic hydrazine in water”, 2017
11. Machakos University Internal Grant – “A Resource Reservation Protocol (RSVP) Technique for Efficient Wi-Fibre Utilization for e-learning Modules within Machakos University”, 2019

THESIS EXAMINATION AND PROGRAMMES DEVELOPMENT

1. MSc Thesis (Concentrations and Risk Assessment of Potentially Toxic Metals in Dust and Sediments from Durban and Environs) – Stella Anyanwu, University of KwaZulu Natal, South Africa
2. MSc Thesis (Assessment of Heavy Metal Contamination in Water, Soil, and Vegetables in two urban streams in Machakos municipality, Kenya) – Rose Tomno, Machakos University
3. Developed two undergraduate programmes, i.e., Bachelor of Science in Analytical Chemistry and Bachelor of Science in Applied Physics and Technology

AWARDS AND RECOGNITION

1. 2024 – Outstanding performance in research grant attraction to the University

SKILLS

- Practical experience in operating high performance liquid chromatography (HPLC), gas chromatography electron capture detector (GC - ECD), and UV/Vis spectrophotometer.
- Basic knowledge in operating gas chromatography mass spectrometer (GC - MS).
- Languages: Fluent in English, Kiswahili, Kikamba, and basic understanding of the German language
- Competent in Microsoft office (Word, Excel, Powerpoint)
- Knowledge of ChemDraw and Sigma Plot softwares
- Good leadership skills, self-motivated, result oriented, and ability to work in a team

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COMMUNITY SERVICE

May 2019 - Present: Executive member of Board of Management and chairperson of the education subcommittee at Ngamba Mixed Secondary School.

July 2018 – Judge, National science and technology exhibition organized by young scientists Kenya (YSK)

MEMBERSHIP OF PROFESSIONAL BODIES

Member of Society for Molecular Imprinting, membership no. 1804

Member of Kenya Chemical Society

Member of Kenya DAAD Scholars Association (KDSA)

REFEREES

Prof. Dr. Boris Mizaikoff
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