

# ENDOWED CHAIR PROGRAMME REPORT

## THE UNESCO UNISA iTEMBA LABS-NRF Africa Chair in Nanosciences and Nanotechnology (U2ACN2)

JANUARY - DECEMBER 2022



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# Personal information of the project leader

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From left to right: Mr Henok Gebretinsae (PhD fellow); Mr Giday Welegergs (PhD fellow); Mr Aluwani Gugu (PhD fellow); Ms Kabelo Mkhando (PhD fellow); Ms Boitumelo Makabachaba (PhD fellow); Dr Sfundo Khanyile (Postdoctoral fellow); Dr Chester Kotsedi (Senior researcher); Prof. M. Maaza (UNESCO Chairman); Mr Siphesihle Panouva (PhD fellow); Mr Awadkarim Ibrahim (Honours student); Ms Keletso Lebesana (PhD fellow); Mr Jadvy Kouka (PhD fellow); Mr Daniel Kpeglo (PhD fellow); Dr Itani Madiba (Senior researcher); Dr Karen Cloete (Senior researcher); Ms Shiva Khosroshahi (PhD fellow); Mr Meisam Aligholami (PhD fellow); Dr Nandipha Botha (Postdoctoral fellow); Ms Cheryl Erasmus (Administrative officer); Dr Nagla Numan (Postdoctoral fellow); Ms Nene Tandjigora (PhD fellow).

# ***The research project***

## ***UNESCO-UNISA-ITLABS/NRF Africa Chair in Nanosciences and Nanotechnologies (U2ACN2)***

The major activities carried out during the 2022 academic and financial year fell within the ambit of the mission and vision of the UNESCO–UNISA–ITLABS/NRF Africa Chair in Nanosciences & Nanotechnologies (U2ACN2).

The major milestones achieved during the 2022 academic and financial year can be summarised as follows:

1. Supervision of 3 MSc & 29 PhD students
2. Graduation of 4 PhD students & 1 MSc student
3. Submission towards graduation of 2 MSc & 6 PhD postgraduates
4. Mentorship of 5 postdoctoral fellows
5. Mentorship of 6 emerging young & early career scientists
6. NRF rating of 2 emerging young scientists
7. 93 ISI-SCI publications in international peer reviewed journals or Scopus DHET-approved journals
8. Eight (8) publications in the prestigious Nature Research journals Nature and Scientific Reports
9. Publication of 1 international US patent; WIPO evaluation of 2 additional patents in process
10. Received 2 international awards: the ICTP Italy award & the L'Oreal UNESCO award for Women in Sciences
11. The largest increase in international citations, reaching nearly 5000 (4945) with a Hirsh index of 85
12. Ranked among the top 2% of highly cited scientists by Clarivate & Stanford Metrics
13. Acquisition of advanced equipment to the value of approximately 14.5 MR
14. Conducting a research programme in line with the VC Catalytic Niche Areas & UN Sustainable Development Goals
15. Establishment and launch of an international open access peer reviewed journal: NanoHorizons
16. Initiation of the African Centre of Competencies in Enhanced Nanosciences & Nanotechnologies for SDGs (ACCENTS)
17. Organisation of 2 international conferences; NanoAfrica (2022) and Africa MRS (2022)
18. 231 visiting scientists and international emerging/young scientists



# Research outputs

No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
1	Accredited Journals (ISI, IBSS or DHET Journals)	State-of-the- art nanoclay reinforcement in green polymeric nanocomposite: from design to new opportunities	Published	<i>M. Minerals</i> 2022, 12, 1495. doi: 10.3390/ min12121495	Kausar, A., Ahmad, I., Maaza, M., Eisa,
2	Accredited Journals (ISI, IBSS or DHET Journals)	Cutting-edge green polymer/nanocarbon nanocomposite for supercapacitor— state-of-the-art	Published	<i>J. Compos. Sci.</i> 2022, 6, 376. doi: 10.3390/ jcs6120376	Kausar, A., Ahmad, I., Maaza, M., Eisa, M.H., Bocchetta, P.
3	Accredited Journals (ISI, IBSS or DHET Journals)	Polymer/fullerene nanocomposite for optoelectronics — moving toward green technology	Published	<i>J. Compos. Sci.</i> 2022, 6, 393. doi: 10.3390/ jcs6120393	Kausar, A., Ahmad, I., Maaza, M., Eisa, M.H., Bocchetta, P.
4	Accredited Journals (ISI, IBSS or DHET Journals)	State-of-the-art of polymer/fullerene C60 nanocomposite membranes for water treatment: conceptions, structural diversity and topographies	Published	<i>Membranes</i> 2023, 13, 27. doi: 10.3390/ membranes1 3010027	Kausar, A., Ahmad, I., Maaza, M., Eisa, M.H.
5	Accredited Journals (ISI, IBSS or DHET Journals)	Avant-garde polymer/graphene nanocomposites for corrosion protection: design, features, and performance	Published	<i>Corros. Mater. Degrad.</i> 2023, 4, 33–53. doi: 10.3390/ cmd4010004	Kausar, A., Ahmad, I., Eisa, M.H., Maaza, M.
6	Accredited Journals (ISI, IBSS or DHET Journals)	An evaluation of the biocatalyst for the synthesis and application of zinc oxide nanoparticles for water remediation	Published	<i>Review. Catalysts</i> 2022, 12, 1442. doi: 10.3390/ catal1211144 2	Zikalala, N.E., Azizi, S., Zikalala, S.A., Kamika, I., Maaza, M., Zinatizadeh, A.A., Mokrani, T.,
7	Accredited Journals (ISI, IBSS or DHET Journals)	Investigation of chemical bath deposited transition metals/GO nanocomposites for supercapacitive electrodes	Published	<i>Crystals</i> 2022, 12, 1613. doi: 10.3390/ cryst12111613	Alshoabi, A., Awada, C., Alnaim, N., Almulhem, N., Obodo, R.M., Maaza, M., Ezema, F.I.
8	Accredited Journals (ISI, IBSS or DHET Journals)	Metal nanoparticles in agriculture: A review of possible use	Published	<i>Coatings</i> 2022, 12, 1586. doi: 10.3390/ coatings1210 1586	Kaningini, A.G., Nelwamondo, A.M., Azizi, S., Maaza, M., Mohale, K.C.



No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
9	Accredited Journals (ISI, IBSS or DHET Journals)	Investigation of the thermal stability of a solar absorber processed through a hydrothermal technique	Published	<i>Solar</i> 2022, 2, 414–431. doi: 10.3390/ solar2040025	Abdullahi, S.A., Akoba, R., Sackey, J., Khamlich, S., Halindintwali, S., Nuru, Z.Y., Maaza, M.
10	Accredited Journals (ISI, IBSS or DHET Journals)	Trimetallic oxides/GO composites optimized with carbon ions radiations for supercapacitive electrodes	Published	<i>Crystals</i> 2022, 12, 874. doi: 10.3390/ cryst12060874	Alshoabi, A., Awada, C., Ahmed, F., Obodo, R.M., Maaza, M., Ezema, F.I.
11	Accredited Journals (ISI, IBSS or DHET Journals)	Morphological features and photoluminescence of ZnO and ZnO decorated S,N-doped few-layered graphene (ZnO–S, N-FLGs)	Published	<i>Journal of Physics and Chemistry of Solids</i> , 2023, 174, 111175	Rotte, N.K., Subbareddy, Y., Puttapati, S.K., Srikanth, V.V.S.S., Kaviyarasu, K.
12	Accredited Journals (ISI, IBSS or DHET Journals)	Design, synthesis, structural characterization, non- linear optical and computational studies of some 3t-butyl- 2r,6c-diarylpiperidin- 4-on-1-ium picrates	Published	<i>Journal of Molecular Structure</i> , 2023, 1274, 134476	Arockia doss, M., Amala, S., Yuvaraj, V., ... Selvanayagam, S., Kaviyarasu, K.
13	Accredited Journals (ISI, IBSS or DHET Journals)	Investigation on the formation of self- assembled CdSe dendrite structures and their photocatalytic efficiency	Published	<i>Inorganic Chemistry Communications</i> , 2023,148, 110309	Venci, X., George, A., Rahul, S., ... John Sundaram, S., Kaviyarasu, K.

No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
14	Accredited Journals (ISI, IBSS or DHET Journals)	Synthesis and characterization of (Ce-Er)FeO <sub>3</sub> nanocomposites for structural, optical, thermal, dielectric, electrical and magnetic applications	Published	<i>Applied Physics A: Materials Science and Processing</i> , 2023, 129(1), 27	Harikrishnan, R., Mani, M., Kumar, M., ... Kaviyarasu, K., Baskaran, I.
15	Accredited Journals (ISI, IBSS or DHET Journals)	Electron-hole recombination effect of SnO <sub>2</sub> – CuO nanocomposite for improving methylene blue photocatalytic activity in wastewater treatment under visible light	Published	<i>Journal of King Saud University – Science</i> , 2023, 35(1), 102388	Perumal, V., Uthrakumar, R., Chinnathambi, M., ... Raja, A., Kaviyarasu, K.
16	Accredited Journals (ISI, IBSS or DHET Journals)	Self-assembly of CdSe 3D urchins and their photocatalytic response	Published	<i>Environmental Research</i> , 2022, 214, 113804	Venci, X., George, A., Raj, A.D., ... Sundaram, S.J., Kaviyarasu, K.
17	Accredited Journals (ISI, IBSS or DHET Journals)	A study on the antibacterial activity of silver nanoparticles derived from Corchorus aestuans leaves and their characterization	Published	<i>Chemical Physics Letters</i> , 2022, 805, 139952	Padmavathi, J., Mani, M., Gokulakumar, B., ... Anantharaj, A., Kaviyarasu, K.
18	Accredited Journals (ISI, IBSS or DHET Journals)	Photocatalytic degradation effect of CdSe nanoparticles for textile wastewater effluents at low cost and proves to be efficient method	Published	<i>Environmental Research</i> , 2022, 213, 113595	Venci, X., George, A., Raj, A.D., ... Al- Mekhlafi, F.A., Wadaan, M.A.
19	Accredited Journals (ISI, IBSS or DHET Journals)	Microstructural and magneto-optical properties of Co <sub>1-x</sub> Ni <sub>x</sub> Fe <sub>2</sub> O <sub>4</sub> nanocomposites for hyperthermia applications and photodegradation of rhodamine B	Published  Published	<i>Solid State Sciences</i> , 2023, 136, 107107  <i>Materials Today Communications</i> , 2022, 33, 104660	Aisida, S.O., Chibueze, T.C., Alnasir, M.H., ... Maaza, M., Ezema, F.I.  Aisida, S.O., Onwujobi, C., Ahmad, I., ... Maaza, M., Ezema, F.I.
20	Accredited Journals (ISI, IBSS or DHET Journals)	Annealing optimization of graphitized Co <sub>3</sub> O <sub>4</sub> @CuO@NiO composite electrodes for supercapacitor applications	Published	<i>Energy Storage</i> , 2022, 4(5), e347	Obodo, R.M., Mbam, S.M., Iwueke, D.C., ... Maaza, M., Ezema, F.I.

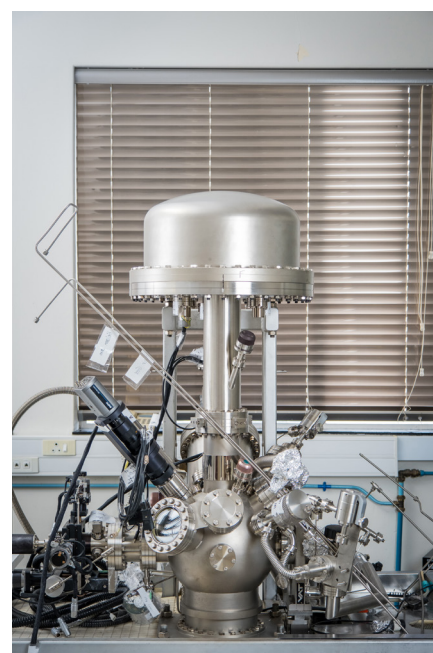
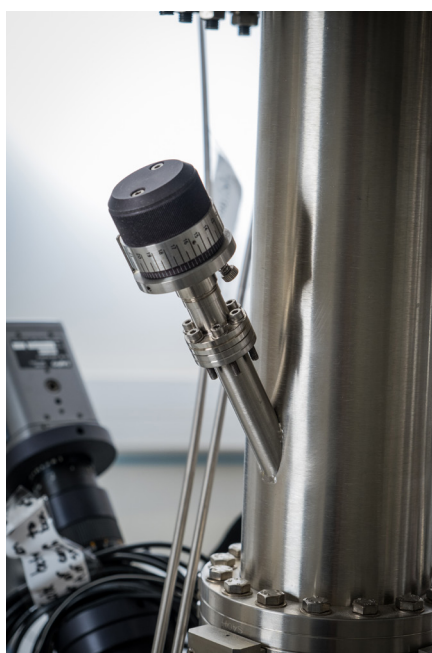


No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
21	Accredited Journals (ISI, IBSS or DHET Journals)	Cellulose from waste materials for electrochemical energy storage applications: a review	Published	<i>Applied Surface Science Advances</i> , 2022, 11,	Ani, P.C., Nzereogu, P.U., Agbogu, A.C., Ezema, F.I., Nwanya, A.C.
22	Accredited Journals (ISI, IBSS or DHET Journals)	Trimetallic oxides/ GO composites optimized with carbon ions radiations for supercapacitive electrodes	Published	<i>Crystals</i> , 2022, 12(6), 874	Alshoaibi, A., Awada, C., Ahmed, F., ... Maaza, M., Ezema, F.I.
23	Accredited Journals (ISI, IBSS or DHET Journals)	Graphene oxide enhanced Co <sub>3</sub> O <sub>4</sub> / NiO composite electrodes for supercapacitive devices applications	Published	<i>Applied Surface Science Advances</i> , 2022, 9, 100254	Obodo, R.M., Mbam, S.M., Nsude, H.E., ... Maaza, M., Ezema, F.I.
24	Accredited Journals (ISI, IBSS or DHET Journals)	Influence of precursor pH on Bi doped ZnSe material via electrochemical deposition technique	Published	<i>Optical Materials</i> , 2022, 127, 112263	Ikhioya, I.L., Ugwuoka, C.O., Obodo, R.M., ... Maaza, M., Ezema, F.I.
25	Accredited Journals (ISI, IBSS or DHET Journals)	Optical and thermoluminescence response of rare earth activated aluminum borate crystals	Published	<i>Materials Research Express</i> , 2022, 9(2), 025501	Ike, P.O., Nwanya, A.C., Agwu, K.K., Ezema, F.I.
26	Accredited Journals (ISI, IBSS or DHET Journals)	Binder-free fabricated CuFeS <sub>2</sub> electrodes for supercapacitor applications	Published	<i>Materials Research Express</i> , 2022, 9(2), 025501	Nsude, H.E., Obodo, R.M., Nsude, K.U., ... Maaza, M., Ezema, F.I.
27	Accredited Journals (ISI, IBSS or DHET Journals)	The effects of doping and temperature on properties of electrochemically deposited Er <sup>3+</sup> doped ZnSe thin films	Published	<i>Optical Materials</i> , 2022, 124, 111979	Obitte, B.C.N., Ikhioya, I.L., Whyte, G.M., ... Maaza, M., Ezema, F.I.

No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
28	Accredited Journals (ISI, IBSS or DHET Journals)	Zinc ferrite nanoparticles capped with Gongronema latifolium for moderate hyperthermia applications	Published	<i>Applied Physics A: Materials Science and Processing</i> , 2022, 128(2), 95	Onyedikachi, O.A., Aisida, S.O., Agbogu, A., ... Maaza, M., Ezema, F.I.
29	Accredited Journals (ISI, IBSS or DHET Journals)	Effects of 7 MeV proton irradiation on microstructural, morphological, optical, and electrical properties of fluorine- doped tin oxide thin films	Published	<i>Surfaces and Interfaces</i> , 2022, 28, 101693 ch 23(1), 31 (2021)	Oryema, B., Jurua, E., Madiba, I.G., ... Ezema, F.I., Maaza, M. .
30	Accredited Journals (ISI, IBSS or DHET Journals)	Radiations induced defects in electrode materials for energy storage devices	Published	<i>Radiation Physics and Chemistry</i> , 2022, 191, 109838	Obodo, R.M., Ramzan, M., Nsude, H.E., ... Maaza, M., Ezema, F.I.
31	Accredited Journals (ISI, IBSS or DHET Journals)	Optimization of MnO <sub>2</sub> , NiO and MnO <sub>2</sub> @NiO elec- trodes using graphene oxide for supercapacitor applications	Published	<i>Current Research in Green and Sustainable Chemistry</i> , 2022, 5, 100345	Obodo, R.M., Nsude, H.E., Eze, C.U., ... Maaza, M., Ezema, F.I.
32	Accredited Journals (ISI, IBSS or DHET Journals)	Effect of cobalt on the photovoltaic properties of zinc selenide thin film deposited on fluorine- doped tin oxide (FTO) via electrochemical deposition technique	Published	<i>Current Research in Green and Sustainable Chemistry</i> , 2022, 5, 100328	Ikhiyoa, I.L., Ugwuoke, C.O., Okoli, D.N., ... Maaza, M., Ezema, F.I.
33	Accredited Journals (ISI, IBSS or DHET Journals)	Influence of precursor pH on the optical and electrical properties of electrochemically deposited cobalt- doped ZnSe thin films for photovoltaic application	Published	<i>Current Research in Green and Sustainable Chemistry</i> , 2022, 5, 100286	Ikhiyoa, I.L., Onah, E.O., Maaza, M., Ezema, F. .
34	Accredited Journals (ISI, IBSS or DHET Journals)	Bio-conjugate of magnesium ferrite nanoparticles in aqueous Allium cepa extract for self- heating potency	Published	<i>Applied Physics A: Materials Science and Processing</i> , 2022, 128(1), 7	Aisida, S.O., Mahmood, A., Ahmad, I., Zhao, T.-K., Ezema, F.I.



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35	Accredited Journals (ISI, IBSS or DHET Journals)	Bio-conjugate of magnesium ferrite nanoparticles in aqueous Allium cepa extract for self- heating Potency	Published	<i>Applied Physics A: Materials Science and Processing</i> , 2022, 128(1), 7	Aisida, S.O., Mahmood, A., Ahmad, I., Zhao, T.-K., Ezema, F.I.
36	Accredited Journals (ISI, IBSS or DHET Journals)	Photocatalytic degradation effect of CdSe nanoparticles for textile wastewater effluents at low cost and proves to be efficient method	Published	<i>Environmental Research</i> , 2022, 213, 113595	Venci, X., George, A., Raj, A.D., ... Al- Mekhlafi, F.A., Wadaan, M.A.
37	Accredited Journals (ISI, IBSS or DHET Journals)	High-temperature laser-assisted synthesis of boron nanorods, nanowires, and bamboo-like nanotubes	Published	<i>Physica Status Solidi (A) Applications and Materials Science</i> , 2023, 220(1), 2200464	Adebisi, M.A., Chen, C.- D., Maaza, M., ... Pillay, M.N., Moodley, M.K.
38	Accredited Journals (ISI, IBSS or DHET Journals)	Synthesis, characterization, and evaluation of Artemisia afra- mediated iron nanoparticles as a potential nano- priming agent for seed germination	Published	<i>ACS Agricultural Science and Technology</i> , 2022, 2(6), pp. 1218–1229	Ndaba, B., Roopnarain, A., Vatsha, B., Marx, S., Maaza,
39	Accredited Journals (ISI, IBSS or DHET Journals)	Effect of rotational speed on the structural, morphological, and optical properties of biosynthesized nickel oxide thin films for selective solar absorber nanocoatings	Published	<i>Energies</i> , 2022, 15(23), 8960	Gebretinsae, H.G., Tsegay, M.G., Welegergs, G.G., Maaza, M., Nuru, Z.Y.



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40	Accredited Journals (ISI, IBSS or DHET Journals)	Optimization of erbium percentage molarity on cobalt selenide semiconductor material via spray pyrolysis deposition technique for photovoltaic application	Published	<i>Journal of the Indian Chemical Society</i> , 2022, 99(12), 100793	Ikhiyoa, I.L., Udeze, C.U., Ochai-Ejeh, F.U., ... Maaza, M., Ezema, F.I.
41	Accredited Journals (ISI, IBSS or DHET Journals)	A novel approach for engineering efficient nanofluids by radiolysis	Published	<i>Nature Scientific Reports</i> , 2022, 12(1), 10767	Maaza, M., Khamliche, T., Akbari, M., ... Gibaud, A., Henini, M.
42	Accredited Journals (ISI, IBSS or DHET Journals)	On the remarkable nonlinear optical properties of natural tomato lycopene	Published	<i>Nature Scientific Reports</i> , 2022, 12(1), 9078	Numan, N., Jeyaram, S., Kaviyarasu, K., ... Sahraoui, B., Maaza, M.
43	Accredited Journals (ISI, IBSS or DHET Journals)	Mercury goes solid at room temperature at nanoscale and a potential Hg waste storage	Published	<i>Nature Scientific Reports</i> , 2022, 12(1), 3494	Kana, N., Morad, R., Akbari, M., ... Gibaud, A., Maaza, M.
44	Accredited Journals (ISI, IBSS or DHET Journals)	From Khoi- San indigenous knowledge to bioengineered CeO <sub>2</sub> nanocrystals to exceptional UV- blocking green nanocosmetics	Published	<i>Nature Scientific Reports</i> , 2022, 12(1), 3468	Ditlopo, N., Sintwa, N., Khamlich, S., ... Krief, A., Maaza, M.
45	Accredited Journals (ISI, IBSS or DHET Journals)	From Himba indigenous knowledge to engineered Fe <sub>2</sub> O <sub>3</sub> UV-blocking green nanocosmetics	Published	<i>Nature Scientific Reports</i> , 2022, 12(1), 2259	Havenga, D., Akoba, R., Menzi, L., ... Gibaud, A., Maaza, M.
46	Accredited Journals (ISI, IBSS or DHET Journals)	Polyethersulfone nanofiltration membrane embedded by magnetically modified MOF (MOF@Fe <sub>3</sub> O <sub>4</sub> ): fabrication, characterization and performance in dye removal from water using factorial design experiments	Published	<i>Polymer Bulletin</i> , 2022, 79(12), pp. 10653–10673	J. Arumugam, Amal George, A. Dhayal Raj, A. Albert Irudayaraj, R.L. Josephine, S. John Sundaram, Amal M. Al- Mohaimed, Wedad A. Alonazi, Mohamed Soliman Elshikh, K. Kaviyarasu



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47	Accredited Journals (ISI, IBSS or DHET Journals)	Polyethersulfone nanofiltration membrane embedded by magnetically modified MOF (MOF@Fe <sub>3</sub> O <sub>4</sub> ): fabrication, characterization and performance in dye removal from water using factorial design Experiments	Published	<i>Polymer Bulletin</i> , 2022, 79(12), pp. 10653–10673	Lalabadi, M.A., Peyman, H., Roshanfekar, H., Azizi, S., Maaza, M.
48	Accredited Journals (ISI, IBSS or DHET Journals)	Optical and thermal behavior of germanium thin films under femtosecond laser irradiation	Published	<i>Nanomaterials</i> , 2022, 12(21), 3786	Abdelmalek, A., Kotsedi, L., Bedrane, Z., ... Girolami, M., Maaza, M.
49	Accredited Journals (ISI, IBSS or DHET Journals)	Insights into the molecular mechanism of triazolopyrimidinone derivatives effects on the modulation of GABA <sub>A</sub> receptor: An in silico approach	Published	<i>Archives of Biochemistry and Biophysics</i> , 2022, 729, 109380	Shafiee, Z., Karami, L., Akbari, M., ... Tabatabai, S.A., Karimi, G.
50	Accredited Journals (ISI, IBSS or DHET Journals)	Green synthesis of CdWO <sub>4</sub> nanorods with enhanced photocatalytic activity utilizing <i>Hyphaene thebaica</i> fruit	Published	<i>ChemistrySelect</i> , 2022, 7(39), e202201442	Mohamed, H.E.A., Hilal-Alnaqbi, A., Dagher, S., Akhosheya, B., Maaza, M
51	Accredited Journals (ISI, IBSS or DHET Journals)	Metal nanoparticles in agriculture: A review of possible use	Published	<i>Coatings</i> , 2022, 12(10), 1586	Kaningini, A.G., Nelwamondo, A.M., Azizi, S., Maaza, M., Mohale, K.C.
52	Accredited Journals (ISI, IBSS or DHET Journals)	Ultra-high thermopower of 3D network architectures of ZnO nanosheet and porous ZnO nanosheet coated carbon fabric for wearable multi- applications	Published	<i>Ceramics International</i> , 2022, 48(19), pp. 28874–28880	George, J., Aiswarya, M., Mythri, V.K., ... Majumdar, A., Veluswamy, P.

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53	Accredited Journals (ISI, IBSS or DHET Journals)	Effect of optimized precursor concentration, temperature, and doping on optical properties of ZnO nanoparticles synthesized via a green route using bush tea ( <i>Athrixia phylicoides</i> DC) leaf extracts	Published	ACS Omega, 2022, 7(36), pp. 31658–31666	Kaningini, A.G., Azizi, S., Sintwa, N., ... Mudau, F.N., Maaza, M.
54	Accredited Journals (ISI, IBSS or DHET Journals)	Revealing enhanced thermoelectric performance of tin-bismuth-telluride materials	Published	<i>Bulletin of Materials Science</i> , 2022, 45(3), 167	Muthumari, M., Manjula, M., Pradheepa, K., Maaza, M., Veluswamy, P.
55	Accredited Journals (ISI, IBSS or DHET Journals)	Computational modeling of the catalytic cycle of the di-chalcogenide compounds in the capture and release of carbon dioxide: effect of temperature and substitution on the catalytic activity	Published	<i>Journal of the Iranian Chemical Society</i> , 2022, 19(9), pp. 3963–3979	Kheirabadi, R., Vakili, M., Morad, R., Maaza, M.
56	Accredited Journals (ISI, IBSS or DHET Journals)	Hydrothermal synthesis and characterization of undoped and W-doped vanadium dioxide nanorods for thermochromic application	Published	<i>Journal of Crystal Growth</i> , 2022, 590, 126702	Numan, N., Madiba, I.G., Khanyile, B.S., Khumalo, Z.M., Maaza, M.
57	Accredited Journals (ISI, IBSS or DHET Journals)	Enhanced optical transmittance of silver nanowires via gamma rays irradiation	Published	<i>Journal of King Saud University - Science</i> , 2022, 34(5), 102058	Honey, S., Khan, H.M., Mazhar, M.E., ... Naseem, S., Maaza, M.
58	Accredited Journals (ISI, IBSS or DHET Journals)	Corn husk multilayered graphene/ZnO nanocomposite materials with enhanced photocatalytic activity for organic dyes and doxycycline degradation	Published	<i>Materials Research Bulletin</i> , 2022, 151, 111800	Sebuso, D.P., Kuvarega, A.T., Lefatshe, K., ... Maaza, M., Muiva, C.M.

No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
59	Accredited Journals (ISI, IBSS or DHET Journals)	Functionalization and modification of polyethylene terephthalate polymer by AgCl nanoparticles under ultrasound irradiation as bactericidal	Published	ACS Omega, 2022, 7(23), pp. 19141–19151	Alidadykhah, M., Peyman, H., Roshanfekar, H., Azizi, S., Maaza, M.
60	Accredited Journals (ISI, IBSS or DHET Journals)	Graphene oxide enhanced Co <sub>3</sub> O <sub>4</sub> / NiO composite electrodes for super capacitive devices applications	Published	Applied Surface Science Advances, 2022, 9, 100254	Obodo, R.M., Mbam, S.M., Nsude, H.E., ... Maaza, M., Ezema, F.I.
61	Accredited Journals (ISI, IBSS or DHET Journals)	Biosynthesized metallic nanoparticles as fertilizers: An emerging precision agriculture strategy	Published	Journal of Integrative Agriculture, 2022, 21(5), pp. 1225– 1242	Ndaba, B., Roopnarain, A., Rama, H., Maaza, M.
62	Accredited Journals (ISI, IBSS or DHET Journals)	Green synthesis of multilayer graphene/ ZnO nanocomposite for photocatalytic applications	Published	Journal of Alloys and Compounds, 2022, 900, 163526	Sebuso, D.P., Kuvarega, A.T., Lefatshe, K., ... Maaza, M., Muiva, C.M.
63	Accredited Journals (ISI, IBSS or DHET Journals)	Novel green synthesized Cr <sub>2</sub> O <sub>3</sub> for selective solar absorber: Investigation of structural, morphological, chemical, and optical properties	Published	Solar Energy, 2022, 236, pp. 308–319	Tsegay, M.G., Gebretinsae, H.G., Welegergs, G., Maaza, M., Nuru, Z.Y.
64	Accredited Journals (ISI, IBSS or DHET Journals)	Two-step chromium photo-precipitation in the sequential UV/sulfite/ manganese dioxide processes: Efficiency, kinetic, energy-economic evaluation, and sludge survey	Published	Journal of King Saud University - Science, 2022, 34(3), 101894	Azizi, S., Sarkhosh, M., Kamika, I., Nkambule, T., Maaza, M.

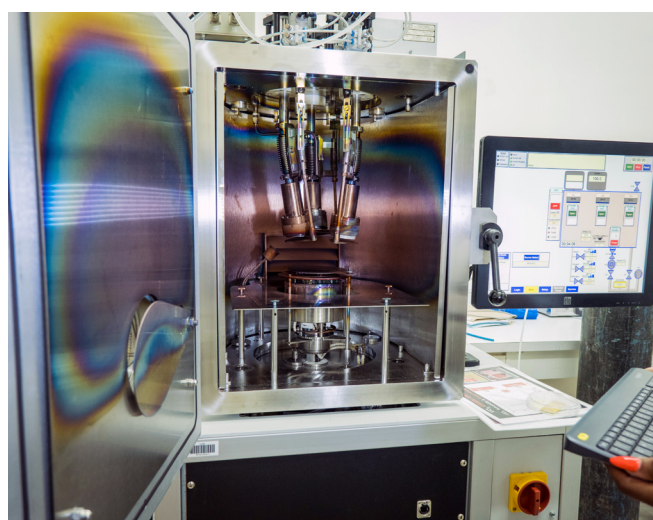
No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
65	Accredited Journals (ISI, IBSS or DHET Journals)	Industrial textile removal using date pit assisted CuO-MgO nanocomposite: Molecular dynamics and biosynthesis analysis	Published	<i>Journal of King Saud University - Science</i> , 2022, 34(3), 101840	Sackey, J., Akbari, M., Tandjigora, N., ... Morad, R., Maaza, M.
66	Accredited Journals (ISI, IBSS or DHET Journals)	Reproducibility and long-term stability of Sn doped MnO <sub>2</sub> nanostructures: Practical photocatalytic systems and wastewater treatment applications	Published	<i>Chemosphere</i> , 2022, 293, 133646	Panimalar, S., Subash, M., Chandrasekar, M., ... Maaza, M., Kaviyarasu, K.
67	Accredited Journals (ISI, IBSS or DHET Journals)	Investigation of physical, magnetic, and electrochemical properties of silver- iron nanoparticles synthesized by gamma radiolysis	Published	<i>Applied Physics A: Materials Science and Processing</i> , 2022, 128(3), 216	Noukelag, S.K., Ngqoloda, S., Chester, L.K., Arendse, C.J., Maaza, M.
68	Accredited Journals (ISI, IBSS or DHET Journals)	Comparing the nature of quantum plasmonic excitations for closely spaced silver and gold dimers	Published	<i>Journal of Chemical Physics</i> , 2022, 156(7), 074102	Jamshidi, Z., Asadi- Aghbolaghi, N., Morad, R., ... Maaza, M., Visscher, L.
69	Accredited Journals (ISI, IBSS or DHET Journals)	Phyto-mediated copper oxide nanoparticles for antibacterial, antioxidant and photocatalytic performances	Published	<i>Frontiers in Bioengineering and Biotechnology</i> , 2022, 10, 820218	Ssekatawa, K., Byarugaba, D.K., Angwe, M.K., ... Sackey, J., Kirabira, J.B.
70	Accredited Journals (ISI, IBSS or DHET Journals)	Binder-free fabricated CuFeS <sub>2</sub> electrodes for supercapacitor applications	Published	<i>Materials Research Express</i> , 2022, 9(2), 025501	Nsude, H.E., Obodo, R.M., Nsude, K.U., ... Maaza, M., Ezema, F.I.
71	Accredited Journals (ISI, IBSS or DHET Journals)	The effects of doping and temperature on properties of electrochemically deposited Er <sup>3+</sup> doped ZnSe thin films	Published	<i>Optical Materials</i> , 2022, 124, 111979	Obitte, B.C.N., Ikhioya, I.L., Whyte, G.M., ... Maaza, M., Ezema, F.I.



No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
72	Accredited Journals (ISI, IBSS or DHET Journals)	Optimization of biodiesel production from sunflower oil transesterification using Ca- K/Al <sub>2</sub> O <sub>3</sub> nanocatalysts	Published	<i>B: Applications</i> , 2022, 35(2), pp. 351–359	Andami, P., Zinatizadeh, A.A., Feyzi, M., ... Norouzi, L., Maaza, M
73	Accredited Journals (ISI, IBSS or DHET Journals)	Zinc ferrite nanoparticles capped with <i>Gongronema</i> <i>latifolium</i> for moderate hyperthermia applications	Published	<i>Applied Physics A: Materials Science and Processing</i> , 2022, 128(2), 95	Onyedikachi, O.A., Aisida, S.O., Agbogu, A., ... Maaza, M., Ezema, F.I
74	Accredited Journals (ISI, IBSS or DHET Journals)	Effects of 7 MeV proton irradiation on microstructural, morphological, optical, and electrical properties of fluorine- doped tin oxide thin films	Published	<i>Surfaces and Interfaces</i> , 2022, 28, 101693	Oryema, B., Jurua, E., Madiba, I.G., ... Ezema, F.I., Maaza, M.
75	Accredited Journals (ISI, IBSS or DHET Journals)	Radiations induced defects in electrode materials for energy storage devices	Published	<i>Radiation Physics and Chemistry</i> , 2022, 191, 109838	Obodo, R.M., Ramzan, M., Nsude, H.E., ... Maaza, M., Ezema, F.I.
76	Accredited Journals (ISI, IBSS or DHET Journals)	Decolorization of baker's yeast wastewater by nanofiltration membrane and performance evaluation using response surface methodology (RSM)	Published	<i>Journal of the Iranian Chemical Society</i> , 2022, 19(2), pp. 635–644	Moradi, M., Zinatizadeh, A.A., Zinadini, S., Azizi, S., Maaza, M.
77	Accredited Journals (ISI, IBSS or DHET Journals)	Argon ions beam irradiation of copper nanowires for transparent electrodes	Published	<i>Materials Horizons: From Nature to Nanomaterials</i> , 2022, pp. 89–110	Honey, S., Kasinathan, K., Mazhar, M.E., ... Asim, J., Maaza, M.

No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
78	Accredited Journals (ISI, IBSS or DHET Journals)	Bio-synthesized and photocatalytic effectiveness of date pit mediated magnesium oxides nanoparticles	Published	<i>Materials Horizons: From Nature to Nanomaterials</i> , 2022, pp. 89–110	Sackey, J., Maaza, M
79	Accredited Journals (ISI, IBSS or DHET Journals)	Optimization of MnO <sub>2</sub> , NiO and MnO <sub>2</sub> @NiO electrodes using graphene oxide for supercapacitor applications	Published	<i>Current Research in Green and Sustainable Chemistry</i> , 2022, 5, 100345	Obodo, R.M., Nsude, H.E., Eze, C.U., ... Maaza, M., Ezema, F.I
80	Accredited Journals (ISI, IBSS or DHET Journals)	Green synthesis and characterization of zinc oxide nanoparticles using bush tea ( <i>Athrixia phylicoides</i> DC) natural extract: Assessment of the synthesis process	Published	<i>F1000Research</i> , 2022, 10, 1077	Kaningini, G.A., Azizi, S., Nyoni, H., ... Mohale, K.C., Maaza, M.
81	Accredited Journals (ISI, IBSS or DHET Journals)	Influence of synthesis method on structural, morphological, magnetic, and antimicrobial properties of Fe-Ag nanoparticles	Published	<i>Journal of Inorganic and Organometallic Polymers and Materials</i> , 2022	Noukelag, S.K., Mewa- Ngongang, M., Ngqoloda, S., ... Arendse, C.J., Maaza, M.
82	Accredited Journals (ISI, IBSS or DHET Journals)	Chitosan-based electrospun mat for the removal of acidic drugs from influent and effluent	Published	<i>Chemical Engineering Communications</i> , 2022	Maphanga, C., Manoto, S., Mabena, C., ... Maaza, M., Mthunzi-Kufa, P.
83	Accredited Journals (ISI, IBSS or DHET Journals)	Laser-enabled delivery of antiretroviral drugs into HIV-1 infected TZM-bl cells	Published	<i>Journal of Biophotonics</i> , 2022	Maphanga, C., Manoto, S., Mabena, C., ... Maaza, M., Mthunzi-Kufa, P.
84	Accredited Journals (ISI, IBSS or DHET Journals)	Theoretical study of e ±-NH <sub>3</sub> scattering	Published	<i>Molecular Physics</i> , 2022, e2097135	Aisida, S.O., Mahmood, A., Ahmad, I., Zhao, T.-K., Ezema, F.I.
85	Accredited Journals (ISI, IBSS or DHET Journals)	Influence of device architectures and mobility on response/recovery time of metal halide perovskites: A review	Published	<i>Journal of Materials Science</i> , 2022, 57(3), pp. 1555–1580	Mukhokosi, E.P., Maaza, M.

No	Research output	Title of the Article/ Book Chapter/ Book/ Monograph	Submitted / accepted / published	Name of the Journal	Authors
86	Accredited Journals (ISI, IBSS or DHET Journals)	Optical properties of Tb <sup>3+</sup> /Yb <sup>3+</sup> co- doped silica-hafnia glass and glass-ceramic thin film	Published	<i>Optical Materials</i> , 2022, 123, 111828	Oulmaati, L., Bouziane, K., Bouajaj, A., ... Chiappini, A., Maaza, M.
87	Accredited Journals (ISI, IBSS or DHET Journals)	ZnO nanoparticles prepared via a green synthesis approach: Physical properties, photocatalytic and antibacterial activity	Published	<i>Journal of Physics and Chemistry of Solids</i> , 2022, 160, 110313	Aldeen, T.S., Ahmed Mohamed, H.E., Maaza, M.
88	Accredited Journals (ISI, IBSS or DHET Journals)	The combination of low level laser therapy and efavirenz drastically reduces HIV infection in TZM-bl cells	Published	<i>Biomedical Journal</i> , 2021, 44(6), pp. S37-S47	Lugongolo, M.Y., Manoto, S.L., Ombinda- Lemboumba, S., Maaza, M., Mthunzi- Kufa, P
89	Book chapters	None			
90	Books	None			
91	Monographs	None			



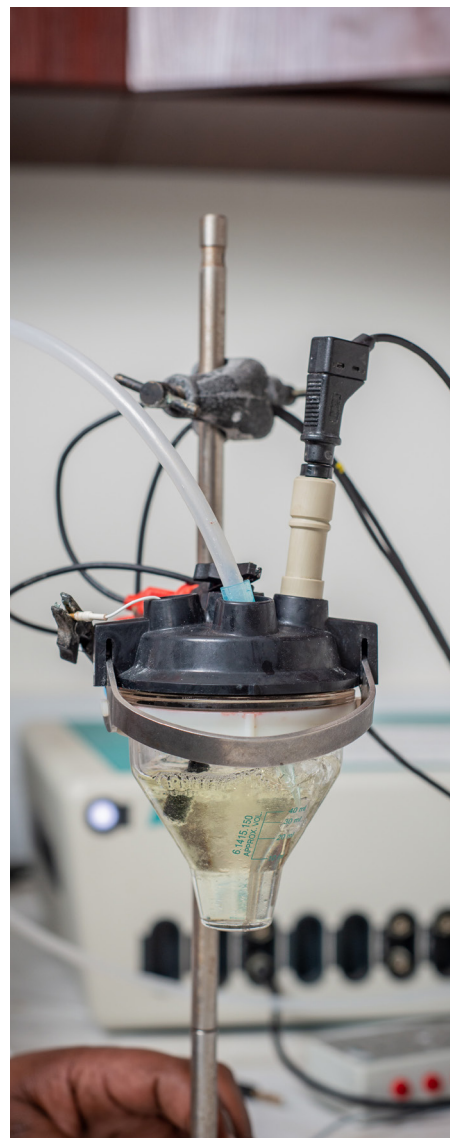
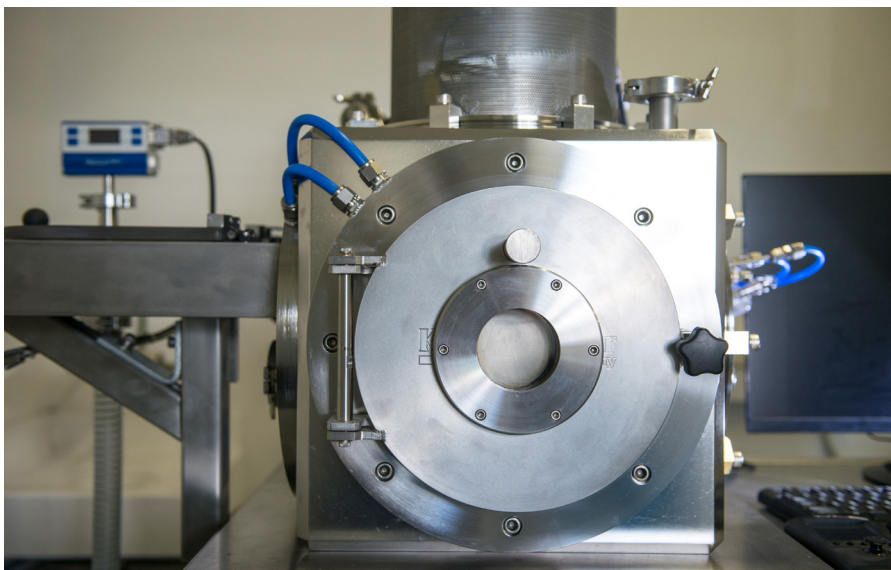


# Impact and influence

## WHAT IMPACT DID THE PROGRAMME HAVE FOR THE RESEARCH CHAIR? EG. Promotion, NRF Rating and Research Career rekindled etc.

The major impacts of this 5-year programme can be summarised as follows, but are not limited to:

1. Attracted a large cohort of postgraduates from Africa and the South (Middle East and Asia)
2. Allowed the rating of 2 early career young scientists (C & B ratings)
3. Created a significant international visibility within the global landscape of nanosciences & materials sciences
4. Supported sustainable research productivity, with a significant increase during 2022 despite the covid pandemic
5. Allowed the publication of a number of contributions in the prestigious Nature Research family of journals (8 Nature Scientific Reports)
6. Supported international cooperation through co-authorship with a variety of international HEIs and RCs and a large number of world-class scientists
7. Further solidified our footprint within the African continent and the South
8. Allowed us to contribute to the implementation of a number of VC niche areas and the UN SDGs
9. Contributed to improving the MiT-Shanghai ranking of Unisa through a large number of citations, international partnership and collaboration through co-authorship as well as publications in the Nature Research family of journals
10. Contributed to intercollege collaboration (CSET, CGS, CHS, CAES & SBL)
11. Contributed towards R&D translations through 2 initial patent & 3 new IP applications via Unisa





## **WHAT INFLUENCE DID YOU HAVE AS A RESULT OF THE CHAIR? EG. Policy Development or Patent application, etc.**

As mentioned previously, this programme has exerted an influence at the national and institutional levels as follows::

1. The possibility of upgrading the UNESCO–UNISA–iTLABS/NRF Africa Chair in Nanosciences & Nanotechnologies to become an African Centre of Competencies. Currently, discussions are being held with international agencies as well as the DSI and NRF.
2. Following the initial international patent which was granted (US202/01056A1), three others are being processed via the Innovation and Commercialisation Directorate.





# Supervision and mentoring

<b>MASTERS STUDENTS</b>	<b>Completed / Submitted / In Progress</b>
<i>Mr Sanelise Naugauza (South Africa)</i>	Submitted
<i>Ms Zerfie Mihabaw (Ethiopia)</i>	Submitted
<i>Mr Gabriel Kanningini (Democratic Republic of Congo)</i>	Graduated early 2022
<i>Mr Snenkosi Snenkosi (South Africa)</i>	In process of finalisation
<i>Mr Awadkarim Ibrahim (Sudan)</i>	In progress

<b>MENTORSHIP: POSTDOCTORAL FELLOWS</b>	<b>Completed / Submitted / In Progress</b>
<i>Dr Nandipha Botha (South Africa)</i>	In progress
<i>Dr Hamza Mohamed (PR, Egypt)</i>	In progress
<i>Dr Mahmood Akbari (PR, Iran)</i>	In progress
<i>Dr Idriss Olayiwola (Nigeria)</i>	In progress
<i>Dr Razieh Morad (PR, Iran)</i>	In progress

<b>"MENTORSHIP" EMERGING YOUNG RESEARCHERS</b>	<b>Completed / Submitted / In Progress</b>
<i>Dr Kasinathan Kaviyarasu (PR, India)</i>	In progress
<i>Dr Itani Madiba (South Africa)</i>	In progress
<i>Dr Shohreh Azizi (PR, South Africa)</i>	In progress
<i>Dr Nolubabalo Matinise (South Africa)</i>	In progress
<i>Dr Nagla Numan (Sudan)</i>	In progress
<i>Dr Karen Cloete (South Africa)</i>	In progress



<b>DOCTORAL STUDENTS</b>	<b>Completed / Submitted / In Progress</b>
<i>Dr Brian Masara (South Africa &amp; Zimbabwe)</i>	Graduated (SBL)
<i>Dr Touria Khamliche (Morocco)</i>	Graduated (CSET)
<i>Dr Adama Fall (Senegal)</i>	Graduated
<i>Dr Ibrahima Ngom (Senegal)</i>	Graduated
<i>Dr Moussa Bakayoko (Ivory Coast)</i>	Graduated
<i>Mrs Rashidah Akoba (Uganda)</i>	Submitted
<i>M. Giday Welegergs (Ethiopia)</i>	Submitted
<i>Mr Henok Gebretinsiae (Ethiopia)</i>	In process of submission
<i>Mr Meresa Tsegay (Ethiopia)</i>	In process of submission
<i>Mr Daniel Kpeglo (Ghana)</i>	In progress
<i>Ms Khawla Hkiri (Tunisia)</i>	In progress
<i>Mr Sanelise Naugauza (South Africa)</i>	In progress
<i>Ms Boitumelo Machabakacha (South Africa)</i>	In progress
<i>Ms Noluthando Ntshangase Kana (South Africa)</i>	In process of submission
<i>Ms Nthombi Ditlopo (South Africa)</i>	In progress
<i>Ms Shiva Khosroshahi (Iran)</i>	In progress
<i>Mr Meisam Aligholami (Iran)</i>	In progress
<i>Ms Maryam Sarkosh (Iran)</i>	In progress
<i>Ms Sandrine Kamdoum Noukelag (Cameroon)</i>	In progress
<i>Ms Nkosingiphile Zikalala (Eswatini)</i>	In progress
<i>Ms S Sintwa (South Africa)</i>	In progress
<i>Ms Thobo Motlhalamme (Botswana)</i>	In progress
<i>Mr Gabriel Kanningini (DRC)</i>	In progress
<i>Ms Livhuwani Mafala (South Africa)</i>	In progress
<i>Ms Nene Tandjigora (Senegal)</i>	In progress
<i>Mr Jadvy Kouka (Congo)</i>	In progress
<i>Mr Juma Moses (Kenya)</i>	In progress

# Details of the collaborators

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## **Prof Norbert Hounkounou**

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# Other external funding awarded

<b>Name of the External Funder</b>	NRS, Canada
<b>Amount Awarded for the current year</b>	Full amount of ~14.5 MR In the form of a fully operational complete system of X-rays and photoelectron spectroscopy with 2 X-ray sources

It is believed that the UNESCO–UNISA–ITLABS/NRF Africa Chair in Nanosciences & Nanotechnologies will be able to generate higher and better outputs if the Chair is upgraded to a CoE or a CoC.

The DSI and the NRF as well as external potential funders have therefore been approached with a proposal to establish an African Centre of Competencies in Enhanced Nanosciences & Nanotechnologies for SDGs (ACCENTS). A full proposal has been finalised.

It has been suggested by various stakeholders that ACCENTS could be hosted within various institutions. ACCENTS is intended to operate in parallel with the UNESCO–UNISA–ITLABS/NRF Africa Chair in Nanosciences & Nanotechnologies (U2ACN2).

Interest has been expressed in ACCENTS in relation to the proposed R&D translations and patents that could be generated.

*M. Maaza*

Prof. M. Maaza

