

NANOAFNET 2 YEARS REPORT

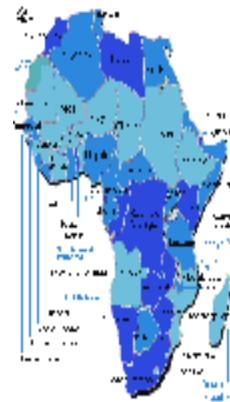
2006-2007

NANOsciences African NETwork

NANOsciences African Network

* : **Materials Research Group
iThemba LABS
National Research Foundation
POBox 722, Somerset West,
7129, Western Cape Province
SOUTH AFRICA**
(: +27 (0) 21 8431149
7 : +27 (0) 21 8433543
, : Maaza@tlabs.ac.za

*NANO*sciences



*NET*work

SPONSORSHIP

NANOafnet is a continental scientific driven initiative supported morally and scientifically by the following major institutions to whom *NANOafnet*'s members are grateful. Alphabetically, they consist of:

- *Abdus Salam ICTP*, Trieste-Italy



- *African Laser Centre*, Pretoria-South Africa



- *African Academy of Sciences*, Nairobi-Kenya



- *Academy of sciences for the Developing Countries*, Trieste-Italy

- *French Embassy in Pretoria*, Pretoria-South Africa



- *Global Nanotechnology Network*, Illinois-USA



- *International Union for Pure and Applied Physics*



- *International centre for Materials Research-Univ. of California Santa Barabara*, USA



- *Themba LABS*, Somerset West-South Africa



- *South African Department of Science & Technology*, Pretoria-South Africa



- *South African National Research Foundation*, Pretoria-South Africa



- *Swedish International development Agency-IPPS*, Stockholm-Sweden



- *International Council of Scientific Unions*,

- *US National Science Foundation*, Arlington-USA



NANOAFNET 2 YEAR REPORT

2006-2007

NANOsciences African NETwork

CONTENT

1-PROGRAM

2-CURRENT CONTINENTAL MEMBERSHIP

3-OUTPUTS

3.1-Capacity Building & postgraduate training

3.2-Senior scientific visits

3.3-Peer review publications

3.4-Conference contributions

3.5-Organized conferences

3.6-Awards and recognitions

1-PROGRAM: NANOSciences African Network: NANOafnet

NANOafnet is a continental initiative, instigated following the ICS-UNIDO North-South Dialogue workshop held in Trieste-Italy in 2005 and officially created subsequent to the IUPAP year of physics held in Durban-South Africa in 2005. Its mission and vision is to embark the S&T African community in the emerging multi-disciplinary field of nanosciences-nanotechnology.

NANOafnet is recognized and/or financially supported by the Abdus Salam ICTP, TWAS, ICSU-ROSSA, IUPAP, US-NSF and NRF-South Africa as well as the Department of Science & Technology of South Africa. Its headquarter is located at iThemba LABS, a national facility of the National Research Foundation-South Africa.

2-CONTINENTAL MEMBERSHIP

NANOafnet has currently about 318 members and representatives from the different following countries: Algeria, Morocco, Tunisia, Egypt, Senegal, Guinea, Guinea-Bissau, Cote d'Ivoire, Burkina Faso, Congo, Ghana, Nigeria, Afrique Central, Cameroon, Benin, DRC-Congo, Sudan, Ethiopia, Uganda, Kenya, Rwanda, Tanzania, Mozambique, Malawi, Zambia, Namibia, Botswana, Lesotho, Swaziland and South Africa. In each country, *NANOafnet* has established a National Contact Point «NCP».

NANOafnet has, in additional to the initial 4 regional coordination nodes (North Africa: Dr. I. Zorkani-Morocco, East Africa: Prof. T. Otitu-Uganda, West Africa: Prof. A.C. Beye-Senegal, South of Africa: Dr. N. Manyala-Lesotho), it has established new 4 coordination nodes in the following regions:

- Middle East-Gulf Area (Dr. K. Bouziane-Oman)
- Europe (Prof. M. Henini-UK)
- North America (Dr. I. Khan-USA)
- India (Prof. P. Chakraborty-India)



National Contact Point continental distribution of NANOafnet.

3-OUTPUTS

3.1-Capacity Building & postgraduate training

NANOafnet, has implemented its major program: the sandwich postgraduate training, focusing the foremost component of its funding received from the Abdus Salam ICTP and co-funding institutions such as the African Laser Centre, the South African Department of Science & Technology, The South African National Research Foundation, iThemba LABS, the South African PBMR program, the Academy of Sciences for the Developing Countries and the International Center for Materials Research-University of California Santa Barbara as well as the US National Science Foundation. *NANOafnet* has and is training about 16 juniors whereby the sponsored sojourns are about 3-6 months up to 1 year. The junior fellows who have/are being promoted via this program are about 16 from 7 different African countries. *NANOafnet* support have been granted to the following MSc/PhD applicants:

- Mr. Girma Gebresenbut HAILU *-Ethiopia*
«The study of porphyrins confinement in nafion membranes».
Addis Ababa University, School of graduate studies, Physics Dept.
Granted MSc: March 2007- Cum laude

- Mr. Slimane. LAFANE *-Algeria*
«Plasma studies of laser ablated SmNdNiO₃»
University of Bab Ezzouar-Algeria
Granted MSc: March 2007

- Mr. Bala Diop NGOM *-Senegal*
«W and Mo doped zinc oxide by pulsed laser deposition»
University of Cheikh Anta-Diop
Granted MSc: March 2007

- Dr. Ali Seddik DIDI *-Morocco*
«magneto-optical properties of quantum dots»
University of dhar El Mehrez-Morocco
Granted PhD: March 2007

- Ms. George Reama CHINEDU *-Nigeria*
«Nano-structured porphyrins for optical and sensing applications»
Obafemi Awolowe University-Nigeria and Rhodes University-South Africa
PhD -«Ongoing research: 2007-2009»

- Mr. Bala Diop NGOM *-Senegal*
«Infrared active Sm_{1-x}Nd_xNiO₃ based nano-switchings»
University of Cheikh Anta-Diop
PhD -«Ongoing research: 2007-2010»

- Mr. Jean Bosco KANA KANA *-Cameroon*
«Novel class of tuneable and reversible Au-VO₂ ultrafast nano-plasmonics»
University of Yaounde-Cameroon
PhD -«Ongoing research: 2007-2010»

- Ms. Saleh KHAMLICH -Morocco
 «Quantum dots and nano-scaled system for solar photonics applications»
 University of dhar El Mehrez-Morocco
PhD -«Ongoing research: 2007-2009»
- Mrs. Thembi MHLUNGU -South africa
 «Anderson localization phenomena in carbon nanotubes».
 University of Zululand, Physics and engineering Dept.,
Granted MSc: April 2007- Cum laude
- Ms. Noluthando NTHSHANGASE -South africa
 «Surface atomic ordering, size effects and phase transitions in Mercury».
 University of Zululand, Physics and engineering Dept.,
Granted MSc: April 2007- Cum laude
- Mr. Praise SIBUYI -South africa
 «Nanorods of $WO_{3-\delta}$ for electrochromic smart windows applications».
 University of Western Cape, Physics and engineering Dept.,
Granted MSc: March 2007
- Mr. Bongani MTSHALI -South africa
 «Investigation of physical properties of C_{60} nanorods synthesized by liquid-liquid interfacial precipitation method: LLIP»
 University of Zululand, Physics and engineering Dept.
MSc «I n review process»
- Mrs. Gugu MHLUNGU -South africa
 «Synthesis and optimization of mesoporous nano-tubular TiO_2 for dye solar cells applications»
 University of Zululand, Physics and engineering Dept.
MSc «I n review process»
- Mr. Patrick Sotobe SIBIYA -South africa
 «Nano-structured diamond-like carbon by pulsed laser ablation»
 University of Zululand, Physics and engineering Dept.
MSc «I n review process»
- Mr. Joseph Makgamathe SITHOLE -South africa
 «Tubular nano-sized ZnO:linear & nonlinear photonics properties »
 University of Kwazulu-Natal-South Africa
PhD -«Ongoing research: 2007-2010»
- Mr. Cebo DLAGAMANDLA -South africa
 «Nano-structured tubular Fe_2O_3 and their application for water splitting and hydrogen sensing»
 University of Zululand-South Africa
PhD -«Ongoing research: 2007-2010»

3.2-Senior scientific visits

NANOafnet, has implemented its second program related to the mobility of senior scientists as early as march 2006. This program was exploited to allow senior visiting scientists from Africa to interact with their junior supervised fellows supported by the *NANOafnet* program and/or to conduct their own research. iThemba LABS being both a South African national facility and headquarters of *NANOafnet*, was employed as a bridge to access numerous premium class national research facilities free of charge. Using its fund-matching strategy with the African Laser Centre program specifically, *NANOafnet* has supported 10 senior scientists so far from 9 different countries. The duration of their sojourn was/is about 1 to up to 3 months. The granted fellows during the period 2006-2007 are:

- Dr. Genene TESSEMA *-Ethiopia*
«Carriers transport in C₆₀ and porphyrins based solar cells»
Addis Ababa University
November 2006

- Prof. Izeddine ZORKANI *-Morocco*
«Modelling of magneto-optical properties of quantum dots»
University of Dhar El Mehrez-Fez
January 2007 & November 2007

- Prof. Jean Marie NDJAKA *-Cameroon*
«Modelling of optical properties of nano-composites»
University of Yaounde-Cameroon
January 2007

- Prof. Kaumba CHINYAMA *-Zambia*
«Physical properties of nano-Titania for dye solar cells applications»
National University of Zambia
June 2006 & July 2007

- Dr. Mahmoud MAHMOUD *-Egypt*
«Biophotonic properties of gold nano-particles»
National Institute for Lasers Enhanced Sciences-Cairo
January 2007

- Dr. Ncholu MANYALA *-Lesotho*
«Synthesis and transport properties of laser ablated Si-Co based spintronics»
National University of Lesotho- Maseru
July 2006-December 2007

• Dr. Tahar KERDJA -Algeria
«SiC and diamond like carbon nano-structures by pulsed laser deposition»
Centre de Developement des Technologies Avancees-Algiers
September 2007

• Dr. Gabriel EGHAREVBA -Nigeria
«Mechanism of growth of porphyrin nanorods by self assembly/molecular recognition»
CERD, Obafemi Awolowe University
Ife-Nigeria
May-July 2007

• Dr. Anil CHAUDHARY -India
«Nonlinear optical properties of Au-LiNb₂O₃ nano-composites»
Burdan University
November-December 2007

• Dr. Adeneyi FASASI -Nigeria
«Synthesis and investigation of linear and nonlinear optical properties of pulsed laser ablation Barium based titanate nano-structures».
CERD, Obafemi Awolowe University
Ife-Nigeria
April-June 2006

• Dr. Khalid BOUZIANE -Oman
«Elemental and crystallographic studies of nanostructured spintronics».
College of Science, Sultan Qaboos University
November 2007

3.3-Peer review publications

NANOafnet's strategy has entailed to its senior and junior co-grantees to ensure peer review type publications in journals with a good impact factor subsequent to each of their visits. The following are the publications where *NANOafnet* and/or its sponsors have been acknowledged:

- Thermo-chromic VO₂ thin films synthesized by rf-inverted cylindrical magnetron sputtering
- *Applied Surface Science*, Online 2007
- J.B. Kana Kana, J.M. Ndjaka, P. Owono Ateba, B.D. Ngom, N. Manyala, O. Nemraoui, A.C. Beye and M. Maaza
- Non-linear absorption and second harmonic imaging of Zn–BaTiO₃ thin films prepared by laser ablation
- *Thin Solid Films*, online 2007
A.Y. Fasasi, M. Maaza, Ch. Theron, P. Neethling, U. Buttner, A. Leitch and A.K. Chaudhary
- Effect of Zn-doping on the structural and optical properties of BaTiO₃ thin films grown by pulsed laser deposition
- *Thin Solid Films*, online 2007
- A.Y. Fasasi, M. Maaza, E.G. Rohwer, D. Knoessen, Ch. Theron and U. Buttner
- Fe_x–V₂O₅ nano-composites: Room temperature magneto-optical and radar absorption properties
- *Optical Materials*, Volume 29, Issue 7, 2007, Pages 760-765
- M. Maaza, O. Nemraoui, C. Sella, A. Gibaud, T.B. Seda and A.C. Beye
- First synthesis of vanadium dioxide by ultrasonic nebula-spray pyrolysis
Optical Materials, Volume 29, Issue 5 2007, Pages 481-487
B. Wakufwa Mwakikunga, E. Sideras-Haddad and M. Maaza
- Buffer effect on GMR in thin Co/Cu multilayers
Journal of Alloys and Compounds, Volume 414, 2006, Pages 42-47
K. Bouziane, A.D. Al Rawas, M. Maaza and M. Mamor
- Induced structural damages by He⁺ irradiation in conducting transparent indium–tin oxide thin films
Solar Energy Materials and Solar Cells, Volume 90, Issue 1, 2006, Pages 111-119
M. Maaza, O. Nemraoui, A.C. Beye, C. Sella and T. Derry
- Thickness induced transversal percolation in Pt–Al₂O₃ nano-composites
Solid State Communications, Volume 137, Issue 3 2006, Pages 166-170
M. Maaza, O. Nemraoui, C. Sella, J. Lafait, B. Baruch-Barak and A.C. Beye
- Thermal induced tunability of surface plasmon resonance in Au–VO₂ nano-photonics
Optics Communications, Volume 254, Issues 1-3, 1 2005, Pages 188-195

- M.Maaza & A.C. Beye
The Nanosciences African network: Nanoafnet
I UMRS-Facets, July, pp.15-18, 2006.

- M. Maaza, M. Mhlungu, N. Cingo, A.C. Beye, A. Govindaraj & C.N.R. Rao
Anderson-Type Localization & Far Infrared Interference Phenomenon in
Disordered Ship-shaped Carbon Nanotubes
I nternational Journal of Nanotechnology. Vol.4, n°6, pp. 638-650, 2007

- M. Maaza & A.C. Beye
Bringing Tunability to Ultrafast Nanoplasmonics
SPI E -Int. society for optical engineering.10.1117/2.1200602.0084-2006

- M.K. Moodley, N.J. Coville, B.C. Holloway & M. Maaza
Synthesis of single walled carbon nanotubes by dual laser vaporization
South African Journal of Sciences,102,p.364-368, 2007.

- M. Maaza, H. Chambalo, S. Ekambaram, B.D.Ngom, O. Nemraoui & N. Manyala
Pulsed laser liquid solid interaction of Pt, Au, Ag and Cu nan-suspensions and
their stability
I nternational Journal of Nano-Manufacturing-2007, Status: «Accepted».

- M. Maaza, O. Nemraoui, K. Bouziane, B.D. Ngom, A.C. Beye & C. Sella
Pulsed laser deposited nano-structured rare earth oxides: Morphological and
structural investigations»
I nternational Journal of Nano-Manufacturing-2007, Status: «Accepted».

- G. Hailu, G. Tessema, N. Manyala, B.D. Ngom and M. Maaza
The study of porphyrins confinement in Nafion membranes
Optical Materials-2007, Status: «In review process»

- G.O. Egharevba, M. Maaza and R.C. George
Time dependency of fabrication of $H_4TPPS_4^{2-}SnTPyP^{2+}$ porphyrin nanorods»
Sensors and Actuators B-2007, Status: «In review process»

- G. Reama, G.O. Egharevba and M. Maaza
Effect of heat on the morphology and optical properties of nano-structured
porphyrins
Sensors and Actuators B-2007, Status: «In review process»

- M. Maaza, O. Nemraoui, C. Sella and A.C. Beye
Surface plasmon resonance tunability in Au-VO₂ thermochromic nano-composites
Gold Bulletin, 38/3, p.3, 2005.

3.4- Conference contributions

NANOafnet members were encouraged, via a seed funding, yet undersized to contribute and market the network by attending national and international conferences. The foremost scientific international conference so far attended in the period of January 2006-January 2008 are:

- The Materials world network, The next ten years
«Materials sciences in Africa»
22nd August 2005,
Cancun-Mexico
- 4th International conference in materials sciences: CISMG 4
«Size effects in nano-materials»
05-2006,
Tlemcen-Algeria
- Annual meeting of the African Laser Centre
«Multifunctional ...photonics applications»
June 2006,
Pretoria-South Africa
- International Union for Pure and Applied Physics: Nanosciences working group
«Nanosciences African network: nanophotonics focus»
September 2006,
Szeged-Hungary
- Global school for advanced studies-Global nanotechnology network
«Dye Solar Cells research activities»
September 2006,
Taipei-Taiwan
- 1st meeting of the Academy of science for the developing countries of young scientists
«Applications of nano-technology in the life sciences»
December 2006,
Nairobi- Kenya
- 6th Edward Bouchet-Abdus Salam institute international conference
«Numerous oral-poster contributions»
January 23-27 January 2007,
Cape Town- South Africa
- 1st US Africa nanosciences workshop
«numerous oral-poster contributions»
28-29 January 2007,
Cape Town- South Africa
- French-South African sciences in synchrotrons workshop
«Order induced effects in nano-confined fluids»

*February 5/12- 2007,
Cape Town- South Africa*

- **1st North South workshop on research & education**
«Les nanosciences: vehicule interfacial.....Le cas de l'Afrique du Sud»
*April 9/13-2007,
Oujda-Morocco*

- **International meeting on materials for electronic applications IMMEA 2007**
«numerous poster contributions»
*April 30-may 2-2007,
Marrakech-Morocco*

- **Africa Day**
«Nanophotonics within the nanosciences African network»
*30 May 2007
Trieste-Italy*

- **3rd African Laser Centre General Meeting**
«Multifunctional nanophotonics & laser processing for photonics applications »
*06-2007,
Lusaka-Zambia*

- **European Materials Research Society Symposium**
« Carbon nitride thin films synthesized by a reactive laser ablation»
*11-14 June 2008,
Strasbourg-France*

- **4th African Materials Research Society symposium**
«Plenary & various poster presentations»
*10-14 December 2007,
Dar Essalam-Tanzania*

- **Gulf-Middle east Regional Workshop on Nanotechnology**
«Nano-materials for Energy Efficiency»
«Properties of Materials at the Nanoscale»
*11-14 January 2008,
Muscat-Oman*

- **Environmental and Biological Applications of Lasers**
«Effect of heat on the morphology and optical properties of porphyrins nano-structures»
«Effect of laser energy on the structural and optical properties of nano-structured W:ZnO»
*19-28 January 2008,
19-29 Cairo, Egypt*

- **Gulf-Middle east Regional Workshop on Nanotechnology**
«Nano-materials for Energy Efficiency»
«Properties of Materials at the Nanoscale»
*11-14 January 2008,
Muscat-Oman*

3.5-Organized conferences

NANOafnet was instrumental in co-organizing scientific international conferences, schools or/and workshops. It has encouraged the participation from the African continent through the possibility of full financial support for outstanding participants from disadvantaged parts of Africa. So far during the 2006-07 period, 1 international conference, 2 workshops and 1 college events were co-organized with the Abdus Salam ICTP among others:

- Co-organization of the 6th Edward Bouchet-Abdus Salam Institute Int. Conference January 23-27 January 2007,

iThemba LABS- South Africa: Headquarters of *NANOafnet*

~ 210 delegates, > 60% African participation

Topics:

- Nanosciences,
- Lasers,
- Materials,
- Nuclear sciences,
- Computational-modelling.

- Co-organization of the 1st US Africa Nanosciences Workshop 28-29 January 2007,

iThemba LABS- South Africa: Headquarters of *NANOafnet*

~ 70 delegates, > 85% African participation

Topics:

- Nanophotonics,
- Nanomaterials,
- Computational-modelling.

- Co-organization of Science at the Synchrotrons 4-12 February 2007,

iThemba LABS- South Africa: Headquarters of *NANOafnet*

~ 80 delegates

Topics:

- Coherent radiations,
- Ultrafast spectroscopy,
- Synchrotron radiations,
- Nanosciences & nanomaterials

- 1st Africa College on Science at the Nano-scale 19-29 November 2007,

iThemba LABS- South Africa: Headquarters of *NANOafnet*

~ 120 delegates

Topics:

- Nanophotonics,
- Organic and inorganic light emitting devices,
- Near field optical microscopy
- Nano-Biophysics
- Nano-fluidics
- Computational & Modelling

3.6-Awards, recognitions and highlights

NANOafnet within its motto of excellence in science and education has improved its scientific visibility through successive achievements which engendered international recognitions and rewards:

- Global School for Advanced Studies Award
17th September 2006
By the Taiwan Department of Science and Technology.
Taipei-Taiwan
- Global Nanotechnology Network Award
04th May 2007
By Tsinghua University and Industrial Technology Research Institute
Taipei-Taiwan
- Cum Laude merit award
March 2007
MSc dissertation awarded by Addis Ababa University-Ethiopia
Addis Ababa-Ethiopia
- Cum Laude merit award
April 2007
MSc dissertation awarded by University of Zululand-South Africa
Kwazulu-Natal- South Africa
- Cum Laude merit award
April 2007
MSc dissertation awarded by University of Zululand-South Africa
Kwazulu-Natal- South Africa
- Great Minds of the 21st Century in «Nanosciences»
20th July 2007
By the US ABI Inc.
Philadelphia- USA
- Outstanding scientists of the 21st century in «Nanophotonics» award
15 June 2007
By the Cambridge IBC
London- United Kingdom
- *1st Highlight:* First demonstration of reversible plasmon tunability in ultra-fast nanoplasmonics
SPI E -Int. society for optical engineering.10.1117/2.1200602.0084-2006
- *2nd Highlight:* First demonstration of quantum mechanic Anderson localization in ship-shaped carbon nanotubes.
International Journal of Nanotechnology. Vol.4, n°6, pp. 638-650, 2007



NANOsciences  NETwork



NANOafnet's senior and junior members at iThemba LABS campus site in 2006.



NANOsciences  NETwork



NANOafnet's senior and junior members at iThemba LABS campus site in 2007.

NANOsciences African NETwork

NANOsciences African Network

* : **M. Maaza**
Chairman
Materials Research Group
iThemba LABS
National Research Foundation
POBox 722, Somerset West,
7129, Western Cape Province
SOUTH AFRICA
(: +27 (0) 21 8431149
7 : +27 (0) 21 8433543
, : Maaza@tlabs.ac.za