

Department of Physics

Prof. Hendrik Swart

Overview

he Department of Physics is in the enviable position of having had a number of highlights in terms of academic excellence and its contributions to the benefit of the Faculty of Natural and Agricultural Sciences have been noteworthy.

One of the highlights was the number of awards students of the department received during the 2007 annual conference of the South African Institute of Physics (SAIP). The 52nd conference was held in Johannesburg and one of the winners was Mr Tobi Oluwafemi, for the best Ph.D. paper (he is a student from the University of Zululand but his research was done at the department). Mr Oluwafemi's promoters were Prof. Hendrik Swart, Departmental Chairperson, and Prof. Neerish Revaprasadu, University of Zululand). The prize for the best Ph.D. poster was awarded to Mr Simon Dhlamini, with Profs Swart, Koos Terblans and Dr Martin Ntwaeaborwa as promoters.

The prize for the best M.Sc. publication was awarded to Ms Lisa Coetsee, with Profs Swart and Terblans as promoters. The best M.Sc. paper in Astrophysics was produced by Mr Brian van Soelen, with Prof. Pieter Meintjes as promoter and the second best paper in Astrophysics was by Mr Edward Jurua, with Prof. Meintjes as promoter. The prize for second best M.Sc. poster was awarded to Mr Werner Jordaan, with Profs Terblans and Swart as promoters. Although this was not an official prize, Mr Jordaan was invited to write an article for the SA *Journal of Science*.

Students took part in the Suid-Afrikaanse Akademie vir Wetenskap en Kuns competition in Pretoria, where Mr Richard Harris and Ms Mariette Erwee shared the second prize. Ms Coetzee won a software prize with her paper while Ms Sonja Nieuwoudt was awarded second prize for her poster. Ph.D. degrees were awarded to Drs L.A. Venter and Rochelle Conradie. M.Sc. degrees were awarded to Messrs Werner Jordaan, Pheneas Nkundakakura, H-C Liu and Shaun Cronjé.

Research in the department is done by two groups, namely the Solid State and the Astrophysics groups:

The **Solid State research group** was successful in obtaining a grant from the National Research Foundation (NRF) to establish a Nano Solid State-lighting research niche area (RNA) (valued at R476 000). Prof. Swart, as leader of the niche area, received an award from the NRF for the highest scoring developed RNA. Only two awards in the developed area were made from a total of more than 80 niche areas.

Prof. Swart was invited to become part of the NRF Assessment Panel for Physics as well as the NRF Niche Area Advisory Committee. The main objective of the research associated with the Nano Solid State-lighting RNA is to develop nanophosphors for applications in infrastructure and high technology flat panel displays. The fabrication and testing of nanophosphors for infrastructure development, and phosphors which will withstand degradation, for flat panel display applications, will be the main challenge. Nanotechnology will provide tools for high tech development as well as development in rural areas. The fabrication of nanophosphors, which have a long after-glow, will provide cheap lighting for people in rural areas, assisting with national infrastructure development, but may also be used in high technology plasma and field emission television screens. This project is done in collaboration with Prof. Neerish Revaprasadi of the Department of Chemistry at the University of Zululand.

Two postdoctoral fellows from India, namely Drs Shivani and Ajay Mishra, were appointed (with money from the joint project) and will be situated at the Council for Scientific and Industrial Research (CSIR) to further strengthen the department's collaboration with Dr Thembela Hillie and Prof. Wynand Steyn at the CSIR. Dr Martin Ntwaeaborwa spent three months with Prof. Paul Holloway at the University of Florida, United States of America (USA), for a sabbatical visit to learn more about synthesis of nanophosphors. Prof. James M. Fitzgerald of Virginia University in the USA made some good SEM and CL measurements for the nanogroup. The SEM images and light output images correlate with each other. A total of nine Ph.D. and four M.Sc. students form part of the solid state group this year.

The approved niche area consists of several sub-focus areas:

Dr Ted Kroon is one of the sub-focus area leaders of the niche area. He obtained a grant to investigate nanocrystalline metals (valued at R116 800). This led to a visit to the CSIR to discuss carbon nanotube production and nanotube composite materials, as well as to the Central University of Technology (CUT) to view mechanical engineering apparatus and laser prototyping tools. During the year Mr Gerhard Olivier, a Ph.D.



The team that came second in the Innovation Fund competition was from the department, with team leader Ms Lisa Coetzee. The team received R30 000 for their project entitled: Light of the future. Here are, from the left: Profs Hendrik Swart, Departmental Chairperson and research leader; Koos Terblans, from the department, Ms Sonja Nieuwoudt, M.Sc. student, Messrs Simon Dhlamini, Ph.D. student, Richard Harris, Ph.D. student, and Dr James Ngaruiya, postdoctoral student from Kenya.

student, designed an Equal Channel Angular Pressing (ECAP) which was manufactured by the Instrumentation division. He also visited Dr Thomas Moyo of the University of KwaZulu-Natal to perform ball milling experiments and research on the incorporation of carbon nanotubes in metal powders.

The nano-crystal segregation subfocus area leader is Prof. Terblans. The focus of the project is to increase knowledge about the physical and chemical processes that are involved during the growth process of metallic nano-crystals and also to understand heat treatments of metallic nano-crystals better. A molecular dynamics software package was developed to study the movements of atoms in and on the surfaces of crystals. The MD Program was used to study the migration of atoms during heat treatments (diffusion in crystals). A second project focuses on segregation energy and the role segregation energy plays during the formation of nano-crystals.

Dr Francis Dejene of the Qwaqwa Campus is the sub-focus area leader of the combination of nano-materials and polymers. This research project focuses primarily on the preparation and characterisation of various types of semiconductor nano-particles blended in a polymer matrix with lattice structure that matches that of the semiconductor particles for light emitting diodes, intended for applications such as plastic optical fiber communications, displays and signal indications. This project is planned as joint research with the polymer group in the Department of Chemistry.

Nanoparticle phosphors synthesised at the department were used for pulsed laser deposition (PLD) of thin luminescent films at the National Laser Centre (NLC). A grant of R221 000 was obtained from the NLC to be used by our research group for the PLD studies. Pt-based alloys are an alternative to Ni-based alloys with better hardness, oxidation and corrosion resistance. Since the Ni alloys, used in jet engine turbines, are already used at 90% of their melting point, the search for an alternative is of the utmost importance. PLD also provides a technique for growing thin films of Pt-based alloys. The PLD was therefore also used in collaboration with Mintek (valued at R200 000) to grow PtAl alloy thin films.

The sol-gel technique for the synthesis of luminescent nanomaterials was further improved under the leadership of Dr Ntwaeaborwa. He is a member of the sub-committee of the South African Nanotechnology Initiative (SANI) that is rolling out the nanotechnology awareness campaign in the country on behalf of the Department of Science and Technology (DST). He occasionally participates in strategic meetings organised by the DST and/or the NRF, which aims to promote nanoscience research and nanotechnology in the country. He was part of the DST delegation that held a series of meetings and workshops which led to the signing of a bilateral agreement for collaborative research in nanoscience between South Africa and South Korea in November 2007. His name appears among the top 20 researchers participating in the Research Development Initiative for Black Academics (REDIBA) programme of the NRF. A successful proposal for the purchase of R1.3 million Raman spectroscopy apparatus was submitted to the NRF equipment programme.

Prof. Swart presented a review on the electron-stimulated surface chemical reaction (ESSCR) mechanism for phosphor degradation at the conference of the International Centre for Material Research (ICMR), in Richards Bay, South Africa. He was accompanied by Dr Ntwaeaborwa who also made a contribution at the conference. Dr Ntwaeaborwa also gave invited talks at iThemba Laboratory for Accelerator-Based Sciences, (the Materials Research Group) and at the CSIR's National Centre for Nanostructured Materials.

Staff members attended several other international conferences. Mr Richard Ocaya gave presentations at the 7th Symposium of the International Federation of Automatic Control (IFAC) on Nonlinear Control Systems (NOLCOS 2007) in Pretoria and at the 8th Conference of the Institute of Electrical and Electronics Engineers (IEEE), Africon 2007 in Windhoek, Namibia. Mr Msomi presented at NSTI-Nanotech 2007, Nanotechnology Conference, Santa Clara, USA and the Hyperfine Interactions XIV International conference on Hyperfine Interactions and XIII International Symposium on Nuclear Quadrupole Interactions (HFI/NQI 2007) at the Iguaçu Falls in Brazil, as well as at the EBASI International Conference, Western Cape. Drs Dejene, James Ngaruiya (postdoctoral student) and Daniel Bem all presented at the 4th International Conference of MRS-Africa, Dar es Salaam, Tanzania. Dr Dejene also presented at the 2nd International Conference on Renewable Energy Sources and Energy Efficiency in Athens, Greece.

Dr Matie Hoffman attended the 14th WIEN2k – WORKSHOP at the Institute of High Performance Computing in Singapore, Malaysia. Presentations were given by several members at the Conference on Photonic Materials, Kariega Game Reserve, South Africa.

The research project for the Armaments Corporation of South Africa (ARMSCOR), investigating the microstructure and high strain rate properties of copper and molybdenum shaped charge liner material was completed after a visit to the CSIR (Ms Retha Rossouw) for Electron backscattering diffraction (EBSD) measurement of grains in copper, with Mr Shaun Cronjé receiving his M.Sc. *cum laude*.

Mr Justice Msomi of the Qwaqwa Campus completed his Ph.D. degree from the School of Physics, University of KwaZulu-Natal, during 2007. His thesis is entitled: Synthesis, structural and magnetic properties of bulk and nanosized (Zn, Cd, Cu)_{0.5}Ni_{0.5}Fe₂O4 and NiFe₂O₄ ferrites. Mr Richard Ocaya of the Qwaqwa Campus also finished his Ph.D. entitled: Robustness in Non-Linear Feedback Control Systems with Power Electronic Converter Applications. In the attempt to answer some important contemporary questions on robust stability and performance of natural or built nonlinear systems, this work defines a detailed framework for quantification of these feedback systems from both a theoretical and a practical perspective. Particular emphasis is laid on the control of affine systems. The plant chosen is the highly nonlinear boost power electronic converter (PEC). The strength of this contribution lies in its presentation and use of Lie symmetries for the exact nonlinear feedback system identification and linearisation from an engineering perspective. In particular, H* control design and μ -analysis are used. Numerous original codes and models in Matlab and PSpice are written to complement the theory. Finally, validation of the design concepts is then done using the simulation results and actual measurements on a +48V prototype.

The **Astrophysics research group** is already considered a very active and dynamic research group in multi-wavelength astrophysics in South Africa. Important evidence of the progress that has been made is the invitation of Prof. Meintjes to become part of the high-profile international High Energy Stereoscopic System (HESS) gamma-ray astrophysics group, as well as his nomination to participate in a research committee to drive the development of the SKA radio telescope array in South Africa.

The Astrophysics group achieved success on several fronts in 2007, namely research publications, conference contributions and the successful completion of three M.Sc. dissertations, of which two passed with distinction (Messrs Nkundubakura and Van Soelen). The



Mr Pheneas Nkundakakura (left), a student of the National Astrophysics and Space Science programme (NASSP), obtained an M.Sc. in Physics in 2007. With him is his study leader, Prof. Pieter Meintjes from the department.



Here are, from left: Drs James Ngaruiya, postdoctoral student, Frances Dejene and Mr Bem Daniel at the 4th International Conference of MRS-Africa, Dar es Salaam, Tanzania.

Astrophysics group was once again joined by two students from the National Astrophysics and Space Science Programme (NASSP), namely Messrs Aniel Wium and Bosco Oruru. There are currently four Ph.D. and three M.Sc. students busy with graduate studies in astrophysics in the department. Dr Louis Venter, who completed his Ph.D. studies successfully in 2007, is currently doing postgraduate research in Paris, France.

In 2007, a special DST grant of R540 000 for promoting multi-wavelength astrophysics at the UFS, was obtained. This grant, in combination with the NRF focus area grants (valued at R115 000), played an important role in expanding the depatment's research infrastructure. With these grants several new research computers were purchased for the Boyden observatory, personnel and graduate students. The Astrophysics group is particularly excited about the purchase of a 5-node parallel cluster (valued at R150 000), which is integrated with the 90-node cluster of the UFS, for high speed computing in astrophysics and surface physics research.

A very valuable addition to the research infrastructure is the develop-



A team from Eunice Primary School won the National Astronomy Quiz. Staff from the UFS Boyden Observatory provided advice and assistance to the Eunice team. Here are, from the left: Naomi Steinberg, Jacquis Ras, Jodie Muller, Pragya Dawadi.

ment of an IRAF-based photometry programme to facilitate our photometric research at the Boyden Observatory. This programme was developed by Mr Hendrik van Heerden in fulfilment of his M.Sc. requirements.

New computerised experimental equipment (driven harmonic systems) for second-year students was purchased from PASCO, and equipment for experiments with microwaves was repaired and upgraded. Several new modules were successfully created and approved: new astrophysics modules on radiative processes (Prof. Meintjes) and a new module on service learning (Dr Hoffman and Mr van Jaarsveldt) will be presented for the first time in 2009. The B.Sc. Hons. in Physics was introduced at the Qwagwa Campus. Four students enrolled in 2007, and three of them are currently busy with their M.Sc. studies.

A workshop on electricity and magnetism was presented to learners at the Sasol TechnoX exhibition in Sasolburg. Prof. Neil Heideman, Vice-Dean of the faculty, was accompanied by Dr Kroon to the Higher Education Quality Committee's (HEQC) evaluator training workshop in Johannesburg. A short overview of the department was presented by Prof. Meintjes at a workshop of the NRF and the Emerging Space Programme at the South African Astronomical Observatory (SAAO) in Cape Town. A new Trac science laboratory was established at the C&N Oranie Meisieskool in collaboration with the

Research Institute for Education Planning (RIEP) at the UFS.

The facilities at Boyden Observatory are being developed according to a master plan which was implemented in 2003. While the first phase of improvements was completed in 2004, the second phase of improvements really gained momentum during 2007 with a further extension of the Charl van der Merwe Education Walk with funds from private sponsorships; a number of interactive exhibits were also implemented, including an interactive skypointer, funded from a DST grant. A total of R550 000 was obtained for further improvements. Dr Hoffman and his team members reached more than 6 800 learners during 2007, with the interactive programme presented at the Boyden Observatory.

The National Science Week organised by the Boyden Science Centre in collaboration with the National Museum in Bloemfontein, the Free State National Botanical Gardens (FNBG), RIEP, the South African Institute for Civil Engineers (SAICE) and other participants provided a large variety of educational activities. The programme included educational activities presented to 63 school groups, reaching 108 teachers and 2 429 learners. Workshop programmes were presented to small groups of two to five teachers and learners from 114 schools, reaching 187 teachers and 200 learners. There were three small public events reaching a total of 163 people. Since most of the

Staff

Main Campus Professor: Prof. Hendrik Swart

Associate Professors: Profs Koos Terblans, Pieter Meintjes, Wiets Roos

Senior Lecturers: Drs Matie Hoffman, Ted Kroon

Lecturer: Dr Martin Ntwaeaborwa

Part-Time Lecturers: Mr Gustav Smit, Dr Rochelle Conradie

Professional Officer: Mr Heinrich Joubert

Administrative Officer: Ms Elsa Pretorius

Qwaqwa Campus

Senior Lecturers: Dr Francis Dejene

Lecturers: Dr Justice Msomi, Messrs Jappie Dolo, Moses Mothudi, Richard Ocaya

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activities involved intensive educational activities of between two and three hours, approximately 6 300 "learning hours" were delivered in this project. Teachers were informed about global warming and how they can integrate this into their lesson plans to create awareness among learners about global warming and the need to prevent it. Manipulation skills learned by some teachers who had never before made use of a microscope in their teaching, was also a strong focus of some of the activities.

Research outputs

Research articles

Coetsee, E., Terblans, J.J. & Swart, H.C. 2007. Cathodoluminescence degradation of Y_2SiO_5 :Ce thin films. *Journal of Vacuum Science and Technology* A 25(4): 1226-1230.

Coetsee, E., Swart, H.C., Terblans, J.J., Ntwaeaborwa, O.M., Hillie, K.T., Jordaan, W.A. & Butner, U. 2007. Characterization of Y_2SiO_5 :Ce thin films. *Optical Materials* 29: 1338-1343.

Coetsee, E., Terblans, J.J. & Swart, H.C. 2007. Degradation of Y₂SiO₅:Ce phosphor powders. *Journal of Luminescence* 126: 37-42.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M. & Swart, H.C. 2007. Synthesis and degradation of the PbS nanoparticle phosphors embedded in SiO₂, (SiO₂:PbS). Surface Review and Letters 14(4): 697-701.

Engelbrecht, J.A.A., Hashe, N.G., Hillie, K.T. & Claassens, C.H. 2007. The apparent effect of sample surface damage on the dielectric parameters of GaAs. *Physica B* 401– 402: 238-241.

Hillie, K.T. & Swart, H.C. 2007. Effects of SnO₂ surface coating on the degradation of ZnS thin film phosphor. *Applied Surface Science* 253: 8513-8516.

Joubert, H.D., Terblans, J.J. & Swart, H.C. 2007. Effect of slow heating and -cooling on the interdiffusion of thin films. *Surface Review and Letters* 14(4): 703-707.

Kroon, R.E. 2007. The classical oscillator model and dielectric constants extracted from infrared reflectivity measurements. *Infrared Physics and Technology* 51: 31-43.

Meintjes, P.J. & Venter, L.A. 2007. A tenuous X-ray corona enveloping AE Aquarii. Monthly Notices of the Royal Astronomy Society 378: 681-690.

Ntwaeaborwa, O.M., Swart, H.C., Kroon, R.E. & Holloway, P.H. 2007. Cathodoluminescence degradation of SiO₂:Ce,Tb powder phosphor prepared by a sol-gel process. *Journal of Vacuum Science and Technology A* 25(4): 1152-1155.

Ocaya, R.O. & Dejene, F.B. 2007. Estimating P-N Diode bulk parameters, Bandgap energy and Absolute Zero by a simple experiment. *European Journal of Physics* 28: 85-91.

Roos, W.D. & Asante, J.K.O. 2007. Determining the segregation parameters in ternary systems from a linear temperature run. *Surface Review and Letters* 14(4): 681-685.

Roos, W.D., Olivier, G.J. & Terblans, J.J. 2007. Estimating the segregation energies in Cu binary systems. *Surface Review and Letters* 14(4): 677-680.

Swart, H.C., Terblans, J.J., Coetsee, E., Ntwaeaborwa, O.M., Dhlamini, M.S. &

Holloway, P.H. 2007. A Short review on the ESSCR mechanism for phosphor degradation. *Journal of Vacuum Science and Technology A* 25(4): 917-921.

Reports

Harris, R.A., Swart, H.C. & Terblans, J.J. 2007. Preliminary report on growth of Pt86: All I:Cr3:Ru2 - super alloy thin films via Pulse Laser Deposition (PLD). Report to Mintek, Johannesburg, South Africa.

Harris, R.A., Swart, H.C. & Terblans, J.J. 2007. Preliminary report (II) on growth of Pt86: All I:Cr3:Ru2 - super alloy thin films via Pulse Laser Deposition (PLD). Report to Mintek, Johannesburg, South Africa.

Conference contributions

Asante, J.K.O. & Roos, W.D. 2007. Comparing segregation profiles of Sn and Sb in single and polycrystalline Cu. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Bem, D.B., Swart, H.C., Luyt, A.S., Coetzee, E. & Dejene, F.B. 2007. Properties of Green $SrAl_2O_4$ Phosphor in LDPE/PMMA Polymer Blends. Poster presented at the 4th International Conference of Materials Research Society, MRS-Africa, Dar es Salaam, Tanzania. 10-14 December.

Coetsee, E., Swart, H.C. & Terblans, J.J. 2007. Y₂SiO₅:Ce thin films grown by PLD. Paper presented at Kariega 2007, Conference on Photonic Materials, Kariega Game Reserve, Eastern Cape, South Africa. 2-6 May.

Coetsee, E., Terblans, J.J. & Swart, H.C. 2007. Luminescent properties of Y_2 sio₅:Ce thin films. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Cronje, S., Kroon, R.E., Roos, W.D., Cloete, T.J. & Neethling, J.H. 2007. Grain structure and twins in deformed copper. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Dejene, F.B., Alberts, V. & Swart, H.C. 2007. Use of diethylselenide [(C2H5)2Se:DESe] as a less-hazardous source for preparation of $Cu(In,Ga)Se_2$ thin films by selenization of InSe/ Cu/GaSe and Cu-In-Ga alloys. Poster presented at ENERTECH 2007: 2nd International Conference on Renewable Energy Sources and Energy Efficiency, Athens, Greece. 18-21 October.

Dejene, F.B., Ocaya, R.O. & Kinyua, R. 2007. Electrical, Optical and Structural Proper-

ties of pure and gold-coated VO_2 thin films on Quartz Substrate. Poster presented at the 4th International Conference of Materials Research Society, MRS-Africa, Dar es Salaam, Tanzania. 10-14 December.

Dejene, F.B., Swart, H.C. & Alberts, V. 2007. The structural, optical and device properties of CulnSe2 thin films and family for solar cell applications (alternative energy sources). Paper presented at the 4th International Conference of Materials Research Society, MRS-Africa, Dar es Salaam, Tanzania. 10-14 December.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M. & Swart, H.C. 2007. Luminescent studies of the SiO₂:PbS nanoparticles grown on Si(100) by pulsed laser deposition. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M. & Swart, H.C. 2007. Photoluminescence properties of SiO₂ surface passivated PbS nanoparticles. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Dhlamini, M.S., Terblans, J.J., Ntwaeaborwa, O.M., Joubert, H.D. & Swart, H.C. 2007. Preparations and luminescent properties of PbS nanoparticle phosphors incorporated in a SiO₂ matrix. Poster presented at Kariega 2007, Conference on Photonic Materials, Kariega Game Reserve, Eastern Cape, South Africa. 2-6 May.

Dolo, J.J., Terblans, J.J., Coetsee, E., Dejene, B.F. & Swart, H.C. 2007. Degradation of Gd_2O_2S : *Tb* phosphor. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Dolo, J.J., Terblans, J.J., Dejene, B.F., Coetsee, E. & Swart, H.C. 2007. Degradation of commercially $Gd_2O_2S:Tb$ phosphor. Poster presented at Kariega 2007, Conference on Photonic Materials, Kariega Game Reserve, Eastern Cape, South Africa. 2-6 May.

Erwee, M. & Meintjes, PJ. 2007. A study of accretion disc turbulence in Dwarf Novae and its implications. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Harris, R.A., Swart, H.C. & Terblans, J.J. 2007. Pulsed laser deposition of Platinum-based alloys. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Jordaan, W.A., Terblans, J.J. & Swart, H.C. 2007. The effect of Nitrogen on the cosegregation

with Molybdenum in a Fe-3,5wt%-N single crystal. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

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Jurua, E., Still, M. & Meintjes, P.J. 2007. Reassessment of the accretion disc clock in Hercules X-1. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Liu, H-C. & Meintjes, PJ. 2007. On The Evolution Of The Novalike Variable Star Ae Aquarii : A Vechicle To Explain The Super Soft X-Ray Sources. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Mathe, T.G., Moyo, T., Katumba, G., Baisitse, T. & Msomi, J.Z. 2007. Optical & magnetic properties of $Zn_{0.5}(Ni, Co)_{0.5}Fe_2O_4$ mixed spinel ferrites thin films. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Mishra, S., Luyt, A.S., Revaprasadu, N., Hillie, K.T., Steyn, W.J.VdM. & Swart, H.C. 2007. Luminescent and physical properties of $SrAl_2O_4$: Eu,Dy and $Sr_4Al_{14}O_{25}$: Eu,Dy Phosphors mixed with polymers. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Mothudi, B.M., Ntwaeaborwa, O.M., Dejene, B.F. & Swart, H.C. 2007. Synthesis and characterization of $SrAl_2O_4$:Eu,Dy. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Motloung, S.J., Dejene, B.F. & Swart, H.C. 2007. Synthesis and characterization of silver nanoparticles. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Moyo, T., Silva, P.R., Saitovitch, H. & Msomi, J.Z. 2007. Green density effects on the structural and magnetic properties of $(Zn, Cd)_{0.5}Ni_{0.5}Fe_2O_4$ ferrites produced by combustion technique. Paper presented at the 6th Edward S. Bouchet International Conference on Physics and Technology for Sustainable Development of Africa (EBASI 2007), iThemba Laboratory for Accelerator Based Sciences, Western Cape, South Africa. 24-26 January.

Msomi, J. & Moyo, T. 2007. Effect of domain transformation on the magnetic properties of $Cu_x Ni_{1-x}Fe_2O_4$ ferrites. Poster presented at the 52nd Annual Conference of the South African

Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Msomi, J.Z. & Moyo, T. 2007. Effect of domain transformation on the magnetic properties of $Cu_{0.5}Ni_{0.5}Fe_2O_4$ oxides. Paper presented at the 10th Annual NSTI-Nanotechnology Conference and Trade Show, Santa Clara, California, USA. 20-24 May.

Msomi, J.Z. & Moyo, T. 2007. Synthesis of $Cu_{0.5}Ni_{0.5}Fe_2O_4$ nanoparticles. Paper presented at the 6th Edward S. Bouchet International Conference on Physics and Technology for Sustainable Development of Africa (EBASI 2007), iThemba Laboratory for Accelerator Based Sciences, Western Cape, South Africa. 24-26 January.

Msomi, J.Z. & Moyo, T. 2007. Temperature dependence of hyperfine fields of $(Ni, Cu)Fe_2O_4$ oxides. Poster presented at the XIV International Conference on Hyperfine Interactions and XVIII International Symposium on Nuclear Quadrupole Interactions (HFI/NQI 2007), Iguaçu Falls, Brazil. 5-10 August.

Ngaruiya, J.M., Ntwaeaborwa, O.M., Coetsee, E. & Swart, H.C. 2007. Enhanced luminescence of SiO_2 : Tb^{3+} induced by an energy transfer from encapsulated ZnO nanoparticles. Paper presented at the 4th International Conference of Materials Research Society, MRS-Africa, Dar es Salaam, Tanzania. 10-14 December.

Nieuwoudt, S., Terblans, J. J., Ntwaeaborwa, O.M., Coetsee, E., Hillie, K.T. & Swart, H.C. 2007. Luminescent properties of nanoparticle $SrAl_2O_4$: Eu^{2+} , Dy^{3+} Phosphor. Poster presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Nkundabakura, P. & Meintjes, PJ. 2007. Search for possible Synchrotron-Compton high energy blazars among the unidentified Egret sources. Paper presented at the 52nd Annual Conference of the South African Institute of Physics (SAIP), Johannesburg, South Africa. 3-6 July.

Ntwaeaborwa, O.M., Dhlamini, M.S., Botha, J.R. & Swart, H.C. 2007. Charaterization of sol-gel SiO₂:Ce, Tb powder and pulsed laser deposited thin film phosphor. Poster presented at Kariega 2007, Conference on Photonic Materials, Kariega Game Reserve, Eastern Cape, South Africa. 2-6 May.

Ntwaeaborwa, O.M., Ngaruiya, J.M., Coetsee, E. & Swart, H.C. 2007. Enhanced luminescence of SiO_2 : Tb^{3+} induced by an energy transfer from encapsulated ZnO nanoparticles. Poster presented at the International Symposium on Nanomaterials, International Centre for Material Research (ICMR), Richards Bay, South Africa. 29 July - I August.

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