

CURRICULUM VITAE

Prof. Eno E. EBENSO FRSC, Pr.Sci.Nat.

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- A. **DATE OF BIRTH:** 18th November, 1964
B. **SEX AND STATUS:** Male and married.
C. **EDUCATIONAL QUALIFICATIONS:**

- ✚ B.Sc. (Hons) Chem. Second Class Upper Division-University of Calabar, P.M.B 1115, Calabar- Nigeria.
- ✚ M.Sc. (Physical Chemistry) -University of Ibadan, Ibadan – Nigeria.
- ✚ Ph.D. (Physical Chemistry) – University of Calabar, P.M. B. 1115, Calabar - Nigeria.

THESIS TITLES

- ✚ B.Sc. -Determination of the degree of association of Organic acids in Benzene and carbon tetrachloride
- ✚ M.Sc. - Kinetics of oxidation of N, N' - diphenyl-p-phenylene diamine in perchloric acid solution
- ✚ Ph.D – Investigation of thin films of some deposited transition metal Oxides and perovskites using nebulized spray pyrolysis technique

ESTABLISHED NRF RESEARCHER IN CHEMISTRY (SOUTH AFRICAN NATIONAL RESEARCH FOUNDATION) – C1 RATING CATEGORY.

H-Index of 25 and 684 CITATION RECORDS in the SCOPUS Search Engine of ELSEVIER SCIENCE since 1996 (<http://www.scopus.com/authid/detail.url?authorId=6602852872>) and over 1652 references.

CURRENTLY **FOURTH** MOST PROLIFIC AUTHOR IN THE FIELD OF CORROSION INHIBITION – content by

Scopus and powered by **NEXTBIO**.

(<http://www.hub.sciverse.com/action/search/results?st=corrosion+inhibition>).

ResearchID:URL: <http://www.researcherid.com/rid/D-2585-2011>
<http://www.tandf.co.uk/journals/pdf/freeaccess/tgcl.pdf> – Green Chemistry Letters and Reviews – One of the Top 10 Downloaded 2010 Articles
<http://www.journals.elsevier.com/corrosion-science/most-cited-articles/>
<http://www.isca.in/rjcs/Editorial-Board.php>
<http://downloads.hindawi.com/journals/ijc/si/gacm.pdf>
<http://www.hindawi.com/35348216/>
<http://www.hindawi.com/journals/ijc/si/gacm/>
<http://www.serialspublications.com/journals1.asp?jid=360&dtype=2&jtype=1>
<http://www.sapub.org/journal/editorialdetails.aspx?JournalID=1099&PersonID=16178>
<http://nwu.academia.edu/EnoEbenso>

D. **WORKING EXPERIENCE**

- ✚ Demonstrator ship/Teaching Assistant (1988-1989)-University of Ibadan; NIGERIA.
- ✚ **ASSISTANT LECTURER (1990-1993)** – Department of Pure & Applied Chemistry, University of Calabar, P.M.B. 1115, Calabar; NIGERIA
- ✚ **LECTURER II (1993-1997)** - Department of Pure & Applied Chemistry, University of Calabar, P.M.B. 1115, Calabar; NIGERIA
- ✚ **LECTURER I (1997-2001)**- Department of Pure & Applied Chemistry, University of Calabar, P.M.B. 1115, Calabar; NIGERIA

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- ✚ **Research Fellow**, (Oct. 1999 – March 2000) – Institute of Organic Chemistry, Universitat des Saarlandes, D-66041 Saarbruecken, GERMANY
- ✚ **SENIOR LECTURER (2001 – 2006)** - Department of Pure & Applied Chemistry, University of Calabar, P.M.B. 1115, Calabar; NIGERIA
- ✚ **POST-DOCTORAL FELLOW (2005 – 2006)** - Institute of Materials Research, Darmstadt University of Technology, D-64287, Darmstadt, GERMANY (Research on Giant Magneto resistance and Spintronic materials).
- ✚ **SABBATICAL LEAVE (2006 – 2007)** - Department of Chemistry, University of Uyo, PMB 1017, Uyo, Nigeria.
- ✚ **PROFESSOR (2008)** - Department of Chemistry, University of Uyo, PMB 1017, Uyo, Nigeria.
- ✚ Department of Chemistry and Chemical Technology, National University of Lesotho, P.O.Roma, 180, Lesotho. Southern Africa (2007 – 2009).
- ✚ **PROFESSOR (2009 till date) – Subject – Chair/HOD, Department of Chemistry (2009- March, 2011) North West University (Mafikeng Campus), Private Bag X2046, Mmabatho 2735, South Africa.**
- ✚ **Director, School of Mathematical and Physical Sciences - North West University (Mafikeng Campus), Private Bag X2046, Mmabatho 2735, South Africa. (March, 2011 till date).**

D1: TEACHING COURSES/MODULES AT UNDERGRADUATE AND POSTGRADUATE LEVELS

- ✚ Group theory and Symmetry
- ✚ Physical Chemistry courses Yrs 1-4
- ✚ Statistical & Chemical Thermodynamics
- ✚ Electrochemistry
- ✚ Atomic, Molecular structure & Symmetry
- ✚ Chemistry of Crystals and Macro molecules
- ✚ Theory of Molecular Spectroscopy
- ✚ Quantum Chemistry
- ✚ Colloid and surface Chemistry
- ✚ Solid State Chemistry
- ✚ Chemical Physics and Statistical/ Quantum Mechanics
- ✚ Chemical Kinetics
- ✚ Introduction to Catalysis
- ✚ First Year GENERAL CHEMISTRY COURSE & PRACTICALS: YEARS 1 - IV.
- ✚ **Organising practicals, teaching and supervision of research projects for undergraduate and postgraduate students (MSc and PhD).**

D2: COURSES OFFERED AT POSTGRADUATE LEVEL/STUDIES

- ✚ Molecular Spectroscopy
- ✚ Applied Spectroscopy
- ✚ Advanced Chemical Thermodynamics
- ✚ Electronics and Instrumentation
- ✚ Advanced Theoretical Chemistry
- ✚ Advanced Chemical Kinetics
- ✚ Process Metallurgy/Hydrometallurgy/Pyrometallurgy
- ✚ Advanced Electrochemistry
- ✚ Colloid and surface Chemistry
- ✚ Thermal and Photochemical Analysis
- ✚ Separation Methods
- ✚ Solid State Chemistry
- ✚ Special Topics in Materials Chemistry and Material Science
- ✚ Physical and Mechanistic Organic Chemistry

E. GRADUATE THESIS SUPERVISION / COLLABORATION

Successfully supervised three (3) PhD (**S.A.Umoren, O. Abakedi and N.O. Eddy**) and two (2) MSc (**S.Adediran and E. Ating**) students thesis. Currently supervising four (4) PhD students in Chemistry department in NWU, South Africa and University of Calabar, Nigeria; four (4) MSc students in Chemistry and one (1) MSc student in Environmental Sciences. Currently, I have three (3) postdoctoral fellows [**Dr. S.K. Shukla, Dr. A.K. Singh and Dr. M. Kabanda**] in my research group.

Am also involved in collaborative research with some professors and research groups in the following universities and institutes (**see evidence in my list of publications**) viz.

- ✚ University of Uyo , Nigeria,
- ✚ University of Port-Harcourt ,Nigeria,
- ✚ Federal University of Technology(FUTO), Owerri ,Nigeria,
- ✚ Jawaharlal Nehru Centre for Advanced Scientific Research(JNCASR), Bangalore 560064, India (Chemistry and Physics of Materials Research Group),
- ✚ Institute of Organic Chemistry and Biochemistry, Universitat des Saarlandes, D-66041, Saarbrucken, Germany and
- ✚ Institute of Materials Research, Darmstadt University of Technology, D-64287, Darmstadt, Germany (Research on Giant Magneto resistance and Spintronic materials).
- ✚ Department of Chemistry, Kocaeli University, 41380, Izmit, Turkey
- ✚ Department of Chemistry, Osmangazi University, 41380, Eskişehir, Turkey, Department of Science and Technology Education, Faculty of Education, Cukurova University, 01338 Adana, Turkey.
- ✚ Department of Physics, Cukurova University, 01338 Adana, Turkey

I HAVE ALSO WON RESEARCH GRANTS FROM THE THIRD WORLD ACADEMY OF SCIENCES (TWAS) AND THE GERMAN ACADEMIC EXCHANGE SERVICE (DAAD).

F. AREAS OF INTEREST**Physical Chemistry:**

- ✚ Electrochemistry, kinetics, adsorption, thermodynamics of corrosion—extensive researches on corrosion inhibition in different media using electrochemical, weight loss, hydrogen evolution and thermometric methods. Synergistic and antagonistic studies. Plant extracts, polymers and synthetic organic and inorganic compounds are used as inhibitors. Colloids and Surface Chemistry (Naturally occurring colloids-exudates gums).
- ✚ Quantum chemical / molecular modeling and theoretical studies of compounds used for corrosion inhibition studies using density functional theory (DFT) and other semi-empirical methods.
- ✚ Chemistry and Physics of Materials. Novel Aspects of solid state Chemistry and material science majoring in thin film deposition using nebulized spray pyrolysis and characterization using XRD, EDAX, SEM, resistivity, magnetization and magneto resistance studies of manganates, cobaltates and double perovskites. Crystallization kinetics of the thin films.
- ✚ Use of ionic liquids as corrosion inhibitors.
- ✚ Thermodynamics and excess molar volumes studies of solutions – developing new area of research.
- ✚ Olefin Metathesis Technology and Catalyst Design: Transformation of oil-derived olefinic compounds (oleochemicals), using olefin metathesis reaction, to fine chemicals and intermediates with potential application in the manufacturing of various niche/strategic market materials such as pharmaceuticals, detergents and polymers (polyesters, polyamides, polyethers, polyurethanes). Such molecular transformations require the use of transition metal catalysts like those based on Re, W, Ru, and Mo and as such development of highly active, selective and stable olefin metathesis catalysts forms the fundamental part of this research. Comparison of the reactions in conventional solvents and ionic liquids [**Collaboration with Prof. Marvey (Mendusa) and Prof. Vosloo (NWU, Potchefstroom)**].

G. CONFERENCES ATTENDED

- (a) 16th Annual National Conference of the Chemical Society of Nigeria, **Sept. 22nd –26th, 1991**, Owerri.
- (b) 21st Anniversary/17th Annual Conference of the Chemical Society of Nigeria, **Sept. 21st – 23rd, 1992**, Lagos.
- (c) 30th Annual Conference of Nigerian Mining & Geosciences Society (NMGS), **6th –10th March, 1994**, Jos.
- (d) 31st Annual Conference of Nigerian Mining and Geosciences Society (NMGS) in Calabar-**12th –16th March, 1995**. Inhibition of Corrosion of mild steel and aluminium in acidic medium by amides and derivatives of TSC: Effect of molecular structural changes.
- (e) 21st Annual International Conference of the Chemical Society of Nigeria, **September 20th –24th (1998)** Ibadan-Nigeria. **Papers Presented were –**
 (i) Inhibition of Corrosion of aluminium in HCl by semicarbazide in methanol/ethanol mixture.
 (ii) Corrosion Behaviour of aluminium in HCl and its inhibition by some amino acids.
- (f) National Corrosion Conference of the Nigerian Corrosion Association (NICA); Corrosion, Port Harcourt **98, 25th-27th November, 1998**, Port Harcourt-Nigeria.
 (i) Inhibition of Corrosion of mild steel in hydrochloric acid by some azo dyes Part 1.
- (g) 25th Annual/International Conference of the Chemical Society of Nigeria (Canaan, 2002) **September 23 -27th 2002** – Calabar – Nigeria.
 (i) Effect of halide ions on the corrosion inhibition in H₂SO₄ using methyl red. Part 1.
- (h) 26th Annual/International Conference of the Chemical Society of Nigeria (Benue 2003) **September 22nd - 25th, 2003**, Markurdi, Benue State – Nigeria.
 (i) Thin films of ordered double perovskite, Sr₂FeMoO₆ by nebulized spray pyrolysis.
- (i) National Conference 2004 and Annual General Meeting Nigerian Corrosion Association **March 24th-27th, 2004**, Port Harcourt – Nigeria. **Papers Presented were -**
 (i) Effect of halide ions on the corrosion inhibition of aluminium and mild steel in acidic medium by gum arabic.
 (ii) Fifteen years of corrosion and corrosion inhibition studies in UNICAL.
- (j) **ERTEP 2007** - First International Conference on Environmental Research, Technology and Policy. **July 17th – 19th 2007**, Accra – Ghana. **Papers Presented were –**
 (i) Blends of polyvinyl pyrrolidone and polyacrylamide as corrosion inhibitors for aluminum in acidic medium.
 (ii) Studies of anti-corrosive effect of *Raphia Hookeri* Exudates gum-halide mixtures for aluminium corrosion in acidic medium.
- (k) 24th Annual Conference/ Congress of the Chemical Society of Ethiopia (CSE).**February 22nd – 24th 2008**, Addis Ababa, Ethiopia. **Papers Presented were –**
 (i) *Phyllanthus Amarus* extracts as eco-friendly corrosion inhibitor for mild steel in acidic media
 (ii) Quantum chemical studies on the inhibition efficiencies of some sulphonamides for the corrosion of mild steel in acidic medium.
 (iii) Inhibition Of Mild Steel Corrosion In Acidic Medium Using Synthetic and Naturally Occurring Polymers and Synergistic Halide Additives
 (iv) Synergistic Inhibition between Naturally Occurring Exudate Gum and Halide Ions on the Corrosion of Mild Steel in Acidic Medium.
- (l) 9th international conference of African Materials Research Society (AMRS) , Abuja , Nigeria 14th to 18th December, 2009. **Papers Presented were –**
 (i) Sulphonamides as corrosion inhibitors of mild steel in acidic medium: experimental and theoretical studies
 (ii) Adsorption and quantum chemical studies of the inhibition properties of tetracycline for the corrosion of mild steel in acidic medium.
- (m) 8 Conferences in 2010 - 2011.

H. **RESEARCH & CONSULTANCY EXPERIENCES**

- **EXTENSIVE RESEARCH ON ELECTROCHEMISTRY, KINETICS/ ADSORPTION/THERMODYNAMICS OF CORROSION STUDIES INVOLVING INHIBITORS IN DIFFERENT MEDIA, MATERIAL SCIENCE (CHEMISTRY & PHYSICS) , QUANTUM MECHANICAL STUDIES OF COMPOUNDS USED FOR CORROSION INHIBITION AND THERMODYNAMICS OF SOLUTIONS.**
- Environmental impact assessment and evaluation studies in oil companies in Nigeria & Mining Industries in Nigeria:
 - ✚ Consultant Chemist for UNICALCONS on Post Impact Assessment of Shell Petroleum Development Company Rumuekpe-Bomu (100km) pipeline, Rivers State – (1991/92).
 - ✚ Consultant Chemist for UNICALCONS on Environmental Effects of Dredging at Shell Petroleum Development Drilling Slot. Cawthorne Channel, New Calabar River, Rivers State – (1992 – 1994).
 - ✚ Consultant Chemist/Environmental Scientist for UNICALCONS on Environmental Evaluation/Impact Assessment of Shell Petroleum Development Company Tank Farm/Terminal – Bonny, Rivers State (1993 –1994).
 - ✚ Consultant Chemist/Environmental Scientist for UNICALCONS on Special Acid Rain Project – Impact of gas flaring of Shell Petroleum Development Company in Eastern Nigeria – (1993 – 1994).
 - ✚ Consultant Chemist for UNICALCONS on the Environmental Evaluation Assessment of Agbada II Flow Station of Shell Petroleum Development Company – Port Harcourt, Rivers State (1994 – 1995).
 - ✚ Consultant Chemist/Water Analyst for Aluminum Smelting Company (ALSCON) P. M. B 1054, Akwa Ibom State (1996 – 1998).
 - ✚ Consultant Chemist/Environmental Scientist on Acid Rain Occurrence in Nsit Ubium Local Government Area, Akwa Ibom State on behalf of Nsit Ubium House-owners Association (1999-2000).
 - ✚ Consultant Chemist/Environmental Scientist on Environmental Evaluation Report (EER) of Brass Terminal of NAOC (2001-2002).
 - ✚ Consultant Chemist/Environmental Scientist for EER of Tebidabba Flow Station of NAOC (2001-2002)
 - ✚ Consultant Chemist/Environmental scientist for EER of Obama Flow Station of NAOC (2001-2002).
 - ✚ Consultant Chemist/Environmental Scientist on Environmental Impact Assessment (EIA) of Odugri, Akri and Agwe Flow Station further Development of NAOC (2001-2002).
 - ✚ Consultant Chemist/Environmental Scientist on Environmental Impact Assessment (EIA) of OML 58 field further Development of TOTAL FINAELF (2001-2002).
 - ✚ Consultant Chemist/Environmental Scientist on the Environmental impact Assessment (EIA) of Ijegu-Yala Dam/Irrigation Project (2002).
 - ✚ Consultant Chemist/Environmental Scientist on the Environmental Impact Assessment studies of the Akwa Ibom state University of Technology Proposed Site (2003-2004).

I. **MONOGRAPH/REPORTS**

Environmental Consultancy REPORTS written for UNICALCONS and other Consultancy firms -

- ✚ Post Impact Assessment of Shell Petroleum Development Company Rumuekpe-Bomu (100km) pipeline, Rivers State – (1992) by UNICAL ENVIRONMENTAL CONSULTANCY SERVICES – **Unpublished report**
- ✚ Environmental Effects of Dredging at Shell Petroleum Development Drilling Slot. Cawthorne Channel, New Calabar River, Rivers State – (1994) by UNICAL ENVIRONMENTAL CONSULTANCY SERVICES. – **Unpublished report**
- ✚ Environmental Evaluation/Impact Assessment of Shell Petroleum Development Company Tank Farm/Terminal – Bonny, Rivers State (1994) by UNICAL ENVIRONMENTAL CONSULTANCY SERVICES. – **Unpublished report**
- ✚ Special Acid Rain Project – Impact of gas flaring of Shell Petroleum Development Company in Eastern Nigeria – (1994) by UNICAL ENVIRONMENTAL CONSULTANCY SERVICES. – **Unpublished report**
- ✚ Environmental Evaluation Assessment of Agbada II Flow Station of Shell Petroleum Development Company – Port Harcourt, Rivers State (1995) by UNICAL ENVIRONMENTAL CONSULTANCY SERVICES. – **Unpublished report**

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- ✚ Acid Rain Occurrence in Nsit Ubium Local Government Area, Akwa Ibom State on behalf of Nsit Ubium House-owners Association (2000) by GLOBEN RESOURCES. – **Unpublished report**
- ✚ Environmental Evaluation Report (EER) of Brass Terminal of NAOC (2002) SPANTRACO NIG LTD. – **Unpublished report.**
- ✚ EER of Tebidabba Flow Station of NAOC (2002) SPANTRACO NIG LTD - **Unpublished report**
- ✚ EER of Obama Flow Station of NAOC (2002) SPANTRACO NIG LTD. - **Unpublished report**
- ✚ Environmental Impact Assessment (EIA) of Odugri, Akri and Agwe Flow Station further Development of NAOC (2002) SPANTRACO NIG LTD. - **Unpublished report**
- ✚ Environmental Impact Assessment (EIA) of OML 58 field further Development of TOTAL FINAELF (2002) by SPANTRACO NIG LTD - **Unpublished report**
- ✚ Environmental impact Assessment (EIA) of Ijegu-Yala Dam/Irrigation Project (2002) by EBONY and IVORY ENVIRONMENTAL SERVICES - **Unpublished report**
- ✚ Environmental Impact Assessment studies of the Akwa Ibom state University of Technology Proposed Site (2004) by AMANA CONSORTIUM. - **Unpublished report**

J. SCIENTIFIC PUBLICATIONS IN PEER REVIEWED JOURNALS

1993

1. **Eno E. Ebenso**, (1993). Degree of association of organic acids in benzene solution. **Tropical Journal of Applied Science. 3; 36 - 44.**

1994

2. U. J. Ekpe, **E. E. Ebenso** and U. J. Ibok (1994). Inhibitory Action of *Azadirachta indica* Leaves extract on the corrosion of mild steel in H₂SO₄. **Journal of West African Science Association. 37; 13 - 30.**

1995

3. U. J. Ekpe, U. J. Ibok, B. I. Ita, O. E. Offiong and **E. E. Ebenso**, (1995). Inhibitory action of methyl and phenyl thiosemicarbazone derivatives on the corrosion of mild steel in HCl. **Material Chemistry and Physics (ELSEVIER SCIENCE, HOLLAND). 40; 87 - 93.**

1996

4. U. J. Ekpe, **E. E. Ebenso** and B. S. Antia (1996). Physicochemical studies of some naturally occurring exudates gums from South Eastern Nigeria. Part 1. **West African Journal of Biological and Applied Chemistry. 41; 16 - 20.**
5. **E. E. Ebenso** and U. J. Ekpe (1996). Kinetic study of corrosion and corrosion inhibition of mild steel in H₂SO₄ using *Carica papaya* leaves extract. **West African Journal of Biological and Applied Chemistry. 41; 21 - 27.**

1998

6. **E. E. Ebenso**, U. J. Ekpe and U. J. Ibok (1998). Studies on the inhibition of mild steel corrosion by some plant extracts in acidic medium. **Discovery & Innovation (AFRICAN ACADEMY OF SCIENCES). 10; 52 - 59.**
7. **E. E. Ebenso**, (1998). Inhibition of aluminium (AA3105) Corrosion in HCl by acetamide and thiourea. **Nigerian Corrosion Journal. 1(1); 29 - 44.**

1999

8. **E. E. Ebenso**, (1999). Kinetics of oxidation of N, N' Diphenyl-p-phenylene diamine by Ce (IV) in aqueous perchloric acid.
Global Journal of Pure and Applied Sciences. **5(1)**; 79 - 84.
9. **E. E. Ebenso**, U. J. Ekpe, B. I. Ita, O.E.Offiong and U. J. Ibok, (1999). Effects of molecular structure on the efficiency of amides and TSC used for corrosion inhibition of mild steel in HCl.
Materials Chemistry and Physics (ELSEVIER SCIENCE, HOLLAND). **60**; 79 - 90.
10. **E. E. Ebenso**, U. J. Ekpe, O. D. Ekpa, U. J. Ibok, B. S. Antia and J. E. Asuquo (1999). Physico-chemical studies of some naturally occurring exudates gums from South Eastern Nigeria. Part 2.
International Journal of Science and Engineering. **2(1)**; 7 - 13.

2000

11. S. Parashar, **E. E. Ebenso**, A. R. Raju and C. N. R. Rao (2000) Insulator-metal transitions induced by electric and magnetic fields in thin films of charge-ordered $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$.
Solid State Communications (ELSEVIER SCIENCE, HOLLAND). **114**; 295 - 299.
12. **E. E. Ebenso**, Kripasindhu Sardar, M. Chandrasekhar, A.R. Raju and C.N.R. Rao (2000). Thin films of $\text{Ln}_{1-x}\text{Sr}_x\text{CoO}_3$ (Ln = La, Nd and Gd) and SrRuO_3 by nebulized spray pyrolysis.
Solid State Sciences (ELSEVIER SCIENCE, HOLLAND). **2**; 833 - 839.

2001

13. **E. E. Ebenso**, (2001). Inhibition of corrosion of mild steel in HCl by some Azo dyes.
Nigerian Journal of Chemical Research. **6**; 8 - 12
14. U. J. Ekpe, P. C. Okafor, **E. E. Ebenso**, O. E. Offiong and B. I. Ita (2001). Mutual effects of TSC derivatives on the acidic corrosion of aluminium.
Bulletin of Electrochemistry (CECRI, INDIA). **17(3)**; 131 - 135.
15. **E. E. Ebenso**, P. C. Okafor, O. E. Offiong, B. I. Ita, U. J. Ibok and U. J. Ekpe (2001). Comparative investigation into the kinetics of corrosion inhibition of aluminium alloy (AA 1060) in acidic medium.
Bulletin of Electrochemistry (CECRI, INDIA). **17(10)**; 459 - 464.

2003

16. **E. E. Ebenso**, P. C. Okafor and U. J. Ekpe (2003) Studies on the inhibition of aluminium corrosion by 2-acetylphenothiazine in chloroacetic acids
Anti-Corrosion Methods & Materials (EMERALDINSIGHT, UK). **50(6)**; 414 - 421.
17. **E. E. Ebenso**, (2003). Effect of halide ions on the corrosion inhibition of mild steel in H_2SO_4 using methyl red. Part 1.
Bulletin of Electrochemistry (CECRI, INDIA). **19(5)**; 209 - 216.
18. **E. E. Ebenso**, (2003). Synergistic effect of halide ions on the corrosion inhibition of aluminium in H_2SO_4 using 2-acetylphenothiazine.
Materials Chemistry and Physics (ELSEVIER SCIENCE, HOLLAND). **79(1)**; 58 - 70
19. P. C. Okafor, **E. E. Ebenso**, U. J. Ibok, U. J. Ekpe and M. I. Ikpi (2003) Inhibition of 4-acetamidoaniline on corrosion of mild steel in HCl solution.
Transactions of SAEST (CECRI, INDIA). **38 (3)**; 91 - 96.

2004

20. **E. E. Ebenso**, P. C. Okafor, U. J. Ekpe, U. J. Ibok and A. I. Onuchukwu (2004). The joint effects of halide ions and methylene blue on the corrosion inhibition of aluminium and mild steel in acid corrodent **Journal of Chemical Society of Nigeria**. **29(1)**; 15 - 25
21. E. E. Oguzie, B.N. Okolue, **E. E. Ebenso**, G. N. Onuoha and A. I. Onuchukwu (2004) Evaluation of the inhibitory effect of methylene blue dye on the corrosion of aluminium in HCl solutions. **Materials Chemistry and Physics (ELSEVIER SCIENCE, HOLLAND)**. **87(2-3)**; 394 - 401
22. P. C. Okafor, **E. E. Ebenso** and U. J. Ekpe (2004). Inhibition of aluminium corrosion by some derivatives of thiosemicarbazone. **Bulletin of Chemical Society of Ethiopia**. **18(2)**; 181- 192
23. **E. E. Ebenso**, (2004). Effect of methyl red and halide ions on the corrosion of aluminium in H₂SO₄, Part 2 **Bulletin of Electrochemistry**. **20(12)**; 551 - 559.
24. **E. E. Ebenso**, U.J.Ibok, U.J. Ekpe, S. Umoren, Ekerete Jackson, O.K. Abiola, N. C. Oforka and S. Martinez (2004) Corrosion inhibition studies of some plant extracts on aluminium in acidic medium. **Transactions of SAEST (CECRI, INDIA)**. **39(4)**; 117 – 123
25. Olusegun K. Abiola, N. C. Oforka and **E. E. Ebenso** (2004) A Potential Corrosion inhibitor for acid corrosion of mild steel. **Bulletin of Electrochemistry (CECRI, INDIA)**. **20(9)**; 409 – 413
26. Olusegun K. Abiola, N.C. Oforka and **E. E. Ebenso** (2004) Inhibition of mild steel corrosion in an acidic medium by fruit juice of *Citrus Paradisi* **Journal of Corrosion Science & Engineering**. **1(1)**; 75 – 78.

2005

27. B. I. Ita and **E. E. Ebenso**, (2005). Novel sol-gel synthesis of nanopolycrystalline LaCrO₃. **International Journal of Science and Technology**. **4(1)**; 1 - 3.
28. **E. E. Ebenso** and E. E. Oguzie (2005) Corrosion inhibition of mild steel in acidic medium by some organic dyes. **Material Letters (ELSEVIER SCIENCE, HOLLAND)**. **59 (17)**: 2163 - 2165
29. P. C. Okafor, U. J. Ekpe, **E. E. Ebenso**, E. M. Umoren and K. E. Leizou (2005) Inhibition of mild steel corrosion in acidic medium using *Allium Sativum* extracts. **Bulletin of Electrochemistry (CECRI, INDIA)**. **21(8)**: 347 – 352

2006

30. **E. E. Oguzie** and E. E. Ebenso (2006) Studies on the corrosion inhibitive effect of congo red dye – halides mixture. **Pigment and Resin Technology (EMERALDINSIGHT, UK)**. **35(1)**: 30 - 35
31. **E. E. Ebenso**, U.J. Ekpe, S. Umoren, Ekerete Jackson, O.K. Abiola and N. C. Oforka (2006) Synergistic effect of halide ions on the corrosion inhibition of aluminium in acidic medium by some polymers. **Journal of Applied Polymer Science (WILEY-INTERSCIENCE, USA)**. **100(4)**: 2889 - 2894
32. E. E. Oguzie, A.I. Onuchukwu, P.C.Okafor and **E.E.Ebenso** (2006) Corrosion inhibition and adsorption behaviour of *Ocinum basilicum* extract on aluminium. **Pigment and Resin Technology (EMERALDINSIGHT, UK)**. **35(2)**: 63 - 70
33. S.A. Umoren, O.Ogbobe, **E.E.Ebenso** and U.J.Ekpe (2006) Effect of halide ions on the corrosion inhibition of mild steel in acidic medium using polyvinyl alcohol. **Pigment and Resin Technology (EMERALDINSIGHT, UK)**. **35 (5)**: 284 - 292
34. S.A. Umoren, **E.E.Ebenso**, P.C.Okafor and O.Ogbobe (2006) Water soluble polymers as corrosion inhibitors of mild steel in acidic medium.

Pigment and Resin Technology (EMERALDINSIGHT,UK). 35 (6): 346 - 352.

35. P. C. Okafor, U. J. Ekpe, **E. E. Ebenso**, N. S. Umo and A. R. Etor (2006) Extracts of *Allium Cepa* and *Allium sativum* as corrosion inhibitor of mild steel in HCl solution.
Transactions of SAEST (CECRI, INDIA). 41(2): 82 – 87
36. S.A. Umoren, O.Ogbobe and **E.E.Ebenso** (2006) Synergistic Inhibition of aluminium corrosion in acidic medium by Gum Arabic and halide ions.
Transactions of SAEST (CECRI, INDIA). 41(2): 74 - 81
37. S.A. Umoren, I. B. Obot, **E.E.Ebenso**, P. C. Okafor, O.Ogbobe and E. E. Oguzie (2006) Gum Arabic as potential corrosion inhibitor for aluminium in alkaline medium and its adsorption characteristics.
Anti- Corrosion Methods & Materials (EMERALDINSIGHT,UK). 53 (5): 277 - 282
38. S.A. Umoren, O.Ogbobe and **E.E.Ebenso** (2006) The adsorption characteristics and synergistic inhibition between polyethylene glycol and halide ions on the corrosion of mild steel in acidic medium.
Bulletin of Electrochemistry (CECRI, INDIA). 22 (4): 155 – 167

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L. TEXTBOOKS

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2. **From Dust to Dust: The Chemistry Alternative (2011)** An INAUGURAL LECTURE by **Prof. Eno E. Ebenso** presented at the North-West University (Mafikeng Campus) , South Africa on the **19th of April, 2011**. ISBN 978-0-9869966-1-0.
3. An Evaluation of Atmospheric Aerosols in Kanana, Klerksdorp Gold Mining Town, North-West Province of South Africa by B. Kaonga and **E.E. Ebenso**. Book Chapter in **“Air Quality Monitoring, Assessment and Management”** edited by Nicolas A. Mazzeo (2011) Part 2, Chapter 14; pages 285 – 304. Intech Open Access Publishers, Croatia. Publication Date: July 2011. ISBN 978-953-307-317-0. (378 pages).

M. RESPONSIBILITIES/COMMUNITY SERVICES

- ✚ Reviewer, Global Journal of Pure and Applied Sciences (NIGERIA).
- ✚ Reviewer, Journal of Applied Polymer Sciences (WILEY-INTERSCIENCE, USA).
- ✚ Reviewer, Materials Chemistry and Physics (ELSEVIER, Holland etc).
- ✚ Reviewer, Journal of Chemical Society of NIGERIA.
- ✚ Reviewer, Pigment and Resin Technology (EMERALDINSIGHT, UK).
- ✚ Reviewer, International Journal of Applied Chemistry (RPI, India).
- ✚ Reviewer, Chemical Engineering Communications, UK
- ✚ Reviewer, Bulletin of Chemical Society of Ethiopia
- ✚ Reviewer, African Journal of Pure and Applied Chemistry
- ✚ Reviewer, Portugaliae Electrochimica Acta
- ✚ Reviewer, Corrosion Science (ELSEVIER, Holland).
- ✚ Reviewer, Journal of Applied Electrochemistry (WILEY-INTERSCIENCE, USA).
- ✚ Reviewer, African Journal of Agricultural Research
- ✚ Reviewer, Scientific Research and Essays
- ✚ Reviewer, International Journal of Electrochemical Science
- ✚ Reviewer, Journal of Molecular Modeling (WILEY-INTERSCIENCE, USA).
- ✚ Reviewer, Molecular Simulation-Journal of Experimental Nanoscience.
- ✚ Reviewer, International Journal of Quantum Chemistry (WILEY-INTERSCIENCE, USA).
- ✚ Reviewer, Journal of Advanced Studies (ELSEVIER, Holland etc).
- ✚ Reviewer, Arabian Journal of Chemistry (ELSEVIER, Holland etc).
- ✚ Reviewer, Arabian Journal of Science and Technology
- ✚ Reviewer, International Journal of Electrochemistry
- ✚ Reviewer, Solid State Electrochemistry
- ✚ Reviewer, International Journal of Corrosion
- ✚ Reviewer, IONICS
- ✚ Reviewer, Research on Chemical Intermediates
- ✚ Reviewer, International Journal of Hydrogen Energy
- ✚ **Member, Editorial board, ‘Recent Patents on Corrosion Science’.**
- ✚ **Member, Editorial board, ‘Journal of Materials and Environmental Science’.**
- ✚ **Member, Editorial board, ‘International Journal of Materials and Chemistry’**
- ✚ **Member, Editorial board, ‘Der Pharma Chemica’ – Online Journal of Medicinal, Pharmaceutical and Computational chemistry.**
- ✚ **Executive Editor – “Achieves of Applied Science Research” (an international peer reviewed journal of applied sciences).**
- ✚ **Editor in Chief - ‘ International Journal of Waste Water Treatment and Green Chemistry ’.**
- ✚ **Guest Editor – to many journals in Chemistry and Material Science.**
- ✚ **External Examiner of MSc and PhD Thesis in numerous universities eg Indian School of Mines University, Dhanbad-826 004, India and some Nigerian Universities.**
- ✚ **External Examiner, Department of Chemistry, University of Zambia.**
- ✚ **External Examiner, PhD Thesis – Postgraduate and Research Department of Chemistry, Bharathidasan University, Tamil Nadu, India.**
- ✚ **External Examiner, PhD Thesis –Department of Chemistry, Gujarat University, Ahmadabad, India.**
- ✚ **Subject Chair, Department of Chemistry, North-West University (Mafikeng Campus), Mmabatho 2735, South Africa (2009 - March, 2011).**
- ✚ **Director, School of Mathematical and Physical Sciences - North -West University (Mafikeng Campus), Private Bag X2046, Mmabatho 2735, South Africa. (March, 2011 till date).**

- ✚ Held several administrative positions in the University of Calabar, Nigeria; member of University senate, National University of Lesotho (to mention a few).
- ✚ Member, Institutional Research Support Commission, North-West University, South Africa.
- ✚ Member, Extended Campus Management Committee, North-West University (Mafikeng Campus), South Africa.
- ✚ Member, Senate, North-West University (Mafikeng Campus), South Africa.
- ✚ Member, Faculty EXCO, Faculty of Agriculture, Science and Technology, North-West University (Mafikeng Campus), South Africa.
- ✚ Member, Technical Reviewer, National Research Foundation Programme (South Africa) – Rating and Research Proposal Funding.
- ✚ Member, Faculty Yearly Research Day Committee, Faculty of Agriculture, Science and Technology, North- West University (Mafikeng Campus), South Africa.
- ✚ Member (Institutional) , Higher Education Qualification Framework (HEQF) Committee – Cluster Coordinator, Life and Physical Sciences, North-West University, South Africa
- ✚ Group Leader, Scarce Skills Development Plan Funding from Dept of Higher Education and Training (DHET), Life and Physical Sciences Category, Faculty of Agriculture, Science and Technology, North-West University (Mafikeng Campus), South Africa.

N. SCHOLARSHIPS, FELLOWSHIPS AND AWARDS RECEIVED

- ✚ Federal Govt. of Nigeria Postgraduate Studies Scholarship Award (1990). M.Sc. in Chemistry – University of Ibadan – Nigeria.
- ✚ Third World Academy of Sciences (TWAS) South-South Fellowship Award (Jan. 1999 – August 1999) at Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore 560064, INDIA.
-Sponsored by the THIRD WORLD ACADEMY OF SCIENCES
C/o The Abdus Salam International Centre for Theoretical Physics (ICTP) Enrico Fermi Building – via Beirut 6-34100 Trieste – ITALY.
- ✚ Deutscher Akademischer Austauschdienst (DAAD) [German Academic Exchange Service] – Short Term Research Fellowship (Oct. 1999 – March 2000) – at Universitat des Saarlandes, D-66041 Saarbruecken, GERMANY.
- ✚ Deutscher Akademischer Austauschdienst (DAAD) [German Academic Exchange Service] – Short Term Research Fellowship (Aug. 2006 – Oct. 2006) – at Technical Universitat des Darmstadt, D-64287 Darmstadt, GERMANY.
- ✚ **AWARDED and CITED in**
 - (a) Marquis WHO'S WHO in American Education (2003/2004, 2006/2007)
 - (b) Marquis WHO'S WHO in Science and Engineering (2006)
 - (c) Marquis WHO'S WHO IN THE WORLD (2006)
- Nominated**
 - (a) 21st Century Award for Achievement in Chemistry- International Biographical Centre, Cambridge. (2003)
 - (b) 2000 Outstanding Intellectuals of the 21st century-International Biographical Centre, Cambridge etc.
- ✚ Best All-round student of the Year Prize (1980/81) – H.W.T.I, Calabar-NIGERIA.
- ✚ Best Mathematics students Prize (1980/81) – H.W.T.I, Calabar-NIGERIA.
- ✚ Visiting Scientist Fellowship (2008 till date) - **Scientific Research Programme Fellowship of Turkey (TUBITAK)** tenable at the Department of Chemistry, Kocaeli University, 41380, Izmit, Turkey.
- ✚ Most Productive Senior Researcher in 2010 - **North -West University (Mafikeng Campus), Private Bag X2046, Mmabatho 2735, South Africa.**
- ✚ **Most Internationally Cited Researcher (2010) in the North -West University – Certificate and Plaque of Recognition. H-Index of 25 and 684 CITATION RECORDS in the SCOPUS Search Engine of ELSEVIER SCIENCE since 1996 (<http://www.scopus.com/authid/detail.url?authorid=6602852872>) and over 1652 references. CURRENTLY FOURTH MOST PROLIFIC AUTHOR IN THE FIELD OF CORROSION INHIBITION – content by **Scopus** and powered by **NEXTBIO** .**
(<http://www.hub.sciverse.com/action/search/results?st=corrosion+inhibition>).

O. MEMBERSHIP OF LEARNED/PROFESSIONAL SOCIETIES

- ✚ Member, Chemical Society of Nigeria (MCSN).
- ✚ Member, American Chemical Society (MACS).
- ✚ Member, New York Academy of Sciences.
- ✚ Member, National Geographical Society.
- ✚ Member, NACE, International Corrosion Society.
- ✚ Member, Nigerian Corrosion Society.
- ✚ Member, Soc. for the Adv. of Electrochemical Science & Technology (SAEST)
- ✚ Member, Chemical Society of Ethiopia
- ✚ Member, International Association of Physical Chemists
- ✚ Member, International Society of Electrochemistry
- ✚ Member, South African Chemical Institute (M.S.A. Chem. I.)
- ✚ Member, South African Council for Natural Scientific Professions (SACNASP) (Pri. Sci. Nat).
- ✚ **Fellow, Royal Society of Chemistry, UK (FRSC)**

P. REFEREES

- | | |
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PROF. EBENSO BRIEF SUMMARY OF RESEARCH

Prof. Eno Ebenso obtained his PhD in Physical Chemistry from the University of Calabar, Nigeria and presently he is a **full professor of Physical Chemistry in the Department of Chemistry and the Director of the School of Mathematical & Physical Sciences**. He has been lecturing in the university system since 1990. His research interest span through physical chemistry (electrochemistry, kinetics, adsorption, thermodynamics of corrosion -extensive researches on corrosion inhibition in different media using electrochemical, weight loss (gravimetric), hydrogen evolution (gasometric), thermometric methods; synergistic and antagonistic studies. Plant extracts, polymers and synthetic organic and inorganic compounds have been used as inhibitors. Quantum chemical / molecular modeling and theoretical studies of compounds used for corrosion inhibition studies using density functional theory (DFT) and other semi-empirical methods , solid state chemistry/contemporary materials chemistry and physics (thin film deposition using nebulised spray pyrolysis technique). **He has published extensively in local and international peer-reviewed journals with strong impact factors and wide readership with over hundred (100) publications.**

He has been a Visiting Scholar at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India (1999), Institute of Organic Chemistry and Biochemistry, Universidad des Saarlandes, Saarbrucken, Germany (1999 - 2000) and the Technical University of Darmstadt, Germany (2006) through Third World Academy of Sciences (TWAS) (1999) and German Academic Exchange Services (DAAD) (1999-2000, 2006) Fellowships, respectively. Presently, he holds a Visiting Scientist Fellowship (2008 till date) from the Scientific Research Programme Fellowship of Turkey (TUBITAK) tenable at the Department of Chemistry, Kocaeli University, 41380, Izmit, Turkey. He has also been awarded and cited in ;(a) Marquis WHO'S WHO in American Education (2003/2004, 2006/2007);(b) Marquis WHO'S WHO in Science and Engineering (2006) and (c) Marquis WHO'S WHO IN THE WORLD (2006). He has been nominated for the; (a) 21st Century Award for Achievement in Chemistry - International Biographical Centre, Cambridge. (2003); (b) 2000 Outstanding Intellectuals of the 21st century - International Biographical Centre, Cambridge and recently International Scientist of the year 2010 by the International Biographical Centre, Cambridge.

He is a reviewer for the following journals (to mention but a few) namely Global Journal of Pure and Applied Sciences , Journal of Applied Polymer Sciences, Materials Chemistry and Physics, Journal of Chemical Society of NIGERIA, Pigment and Resin Technology, Chemical Engineering Communications (UK), Bulletin of Chemical Society of Ethiopia, African Journal of Pure and Applied Chemistry, Portugaliae Electrochimica Acta, Corrosion Science, Journal of Applied Electrochemistry, International Journal of Corrosion, International Journal of Electrochemistry, International Journal of Molecular Sciences, African Journal of Agricultural Research, Scientific Research and Essays, International Journal of Electrochemical Science, Journal of Molecular Modeling, Molecular Simulation -Journal of Experimental Nanoscience. He is a member of the editorial board of the following journals namely 'Research Journal of Chemical Sciences', 'Journal of Materials and Environmental Sciences' , 'Recent Patents on Corrosion Science' and 'Der Pharma Chemica' – Online Journal of Medicinal, Pharmaceutical and Computational chemistry; the executive editor of "Achieves of Applied Science Research" (an international peer reviewed journal of Applied Sciences). He is a member of the Chemical Society of Nigeria (MCSN), American Chemical Society (MACS), New York Academy of Sciences, National Geographical Society, Nigerian Corrosion Society, Society for the Advancement of Electrochemical Science & Technology (SAEST), International Society of Electrochemistry, International Association of Physical Chemists, Chemical Society of Ethiopia, South African Chemical Institute (M.S.A. Chem. I.) and South African Council for Natural Scientific Professions (SACNASP) and many other scientific professional bodies. **He is also a Fellow of the Royal Society of Chemistry, UK. He presented his Inaugural Lecture titled, "FROM DUST TO DUST: THE CHEMISTRY ALTERNATIVE" on the Mafikeng Campus on the 19th of April, 2011.**

BRIEF DESCRIPTION OF HIS COMPLETED RESEARCHES

His research over the years has been focused on corrosion and corrosion inhibition studies using different materials and compounds as inhibitors in different media (acidic and basic) via electrochemical, weight loss, hydrogen evolution and thermometric methods. The application of the principles of physical chemistry (like kinetics, thermodynamics, adsorption, quantum chemical concepts and calculations) and materials science (chemistry and physics) has been used and reflected in his research over the years. During the period he has completed and published several studies in peer reviewed international and local journals of wide readership. The completed researches include but are not limited to;

(a) The use of plant extracts (green and environmentally friendly) - (*Carica papaya*, *Azadirachta indica*, *Phyllanthus amarus*, *Garcinia cola*, *Delonix regia*, *Ocinum basilicum*, *Piper guinensis*, *Musa sapientum*, *Allium cepa*, *Allium sativum*) and naturally occurring polymers (exudates gums namely *Raphia Hookeri*, *Pachylobus edulis*, *Gum Arabic*, *Dacryodes edulis*) as corrosion inhibitors published in the following journals; Desalination (2009), Pigment and Resin Technology (2006 - 2010), Corrosion Science (2008, 2009), Anticorrosion Methods and Materials (2006, 2007) (all DOE accredited and Thomson ISI/Web of Science journals) and others published in DOE non accredited journals (Portugaliae Electrochimica Acta, Bulletin of Electrochemistry, Trans. SAEST), just to mention but a few;

(b) Synergistic, kinetics, adsorption and thermodynamic studies using synthetic polymers such as polyvinyl chloride (PVC), polyethylene glycol (PEG), polyvinyl alcohol (PVA), polyacrylamide (PAA) and polyvinyl pyrrolidone (PVP) as corrosion inhibitors and the effect of halides in different media published in Journal of Applied Polymer Science (2006 - 2009), Indian Journal of Chemical Technology, (2008), Materials Chemistry and Physics (2007), Pigment and Resin Technology (2006), International Journal of Electrochemical Sciences (all DOE accredited and Thomson ISI/Web of Science journals)

and others published in DOE non accredited journals(Portugaliae Electrochimica Acta, Bulletin of Electrochemistry, Trans. SAEST), just to mention but a few;

(c) Use of other synthetic organic and inorganic compounds such as thiosemicarbazones and its derivatives, dyes (methyl red, methylene blue, methyl orange, thymol blue, solochrome black T etc), acetylphenothiazine, acetamidoaniline etc as corrosion inhibitors and the effect of halides in different media published in Pigment and Resin Technology (2006), Materials Letters (2005), Materials Chemistry and Physics (2003, 2004), Bulletin of Chemical Society of Ethiopia (2004), Anticorrosion Methods and Materials (2003) (all DOE accredited and Thomson ISI/Web of Science journals) and others published in DOE non accredited journals;

(d) Most recently the use of some quantum chemical ,molecular modeling , theoretical and Quantitative Structure Activity Relationship (QSAR) studies of compounds used as corrosion inhibitors [e.g. some sulphonamides (namely sulfaacetamide , sulfapyridine , sulfamerazine, sulfathiazole, sulfaguanidine, sulfamethazine, sulfamethoxazole and sulfadiazine), rhodanine azo sulpha compounds (namely 5-sulphadiazineazo-3-phenyl-2-thioxo-4-thiazolidinone, 5-sulphamethazineazo-3-phenyl-2-thioxo-4-thiazolidinone, 5-sulphadimethoxineazo-3-phenyl-2-thioxo-4-thiazolidinone, 5-sulphamethoxazoleazo-3-phenyl-2-thioxo-4-thiazolidinone] using density functional theory (DFT) at the B3LYP/6-31G (d,p) and BP86/CEP-31G* basis set levels and other semi empirical methods and ab initio calculations using the RHF/6-31G (d,p) published in Corrosion Science (2009), Journal of Molecular Modelling (2009) and some recently published in International of Electrochemical Science (2010-2011) (20 papers), International Journal of Molecular Science, International Journal of Quantum Chemistry (2010 - 2011) (2 papers), Journal of Molecular Modelling (2010) (1 paper) and Journal of Applied Electrochemistry (2010) (1 paper) (all DOE accredited and Thomson ISI/Web of Science journals), to mention just a few.

During the past and prior to last ten years he delved into the area of Chemistry and Physics of Materials which involved the deposition of thin films of some ferromagnetic oxides showing metallic conductivity with perovskite structure (e.g. SrRuO_3), ordered double perovskites, $\text{A}_2\text{B}'\text{B}''\text{O}_6$ (A being alkaline earth or rare-earth ion; transition metals B' and B'' occupy the transitional metal sites perovskite B sites) (e.g. $\text{Sr}_2\text{FeMoO}_6$), rare-earth cobaltates with perovskite structure exhibiting metal-insulator transition e.g. $\text{Ln}_{1-x}\text{A}_x\text{CoO}_3$ series (where Ln = La, Nd and Gd; x = 0.0, 0.1, 0.3 and 0.5; A = Sr) and rare-earth manganate with perovskite structure e.g. $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$ series (x = 0.3 and 0.4) using nebulized spray pyrolysis technique. The thin films were characterized using XRD, EDAX and SEM. Further studies were done on the resistivity, magnetization and magnetoresistance properties of the thin films. The results of these researches were published in the journals; Solid State Communications and Solid State Sciences in 2000. He is also considering the possibility of reviving this interesting area of research in future considering the application of some of these double perovskites in spintronics and other electronic devices.

ONGOING AND PLANNED FUTURE RESEARCH

His ongoing research and aim over the next five years will be concentrated on four core areas with smaller – explanatory projects. The core themes for the next five years are as follows though some work is ongoing on some of the research themes:

(a) Quantum chemical, theoretical and Quantitative Structure Activity Relationship studies of the corrosion inhibition efficiencies of some compounds namely penicillin compounds, thiosemicarbazides, furfural hydrazone derivatives, fluoroquinolones used as corrosion inhibitors. The methods of density functional theory (DFT) at the B3LYP/6-31G (d,p) and B3LYP/6311G(d,p) basis set levels and some semi empirical methods will be used to determine the relationship between the molecular structure of the compounds and their corrosion inhibition efficiencies (%IE). The quantum chemical parameters, namely E_{HOMO} (highest occupied molecular orbital energy) , E_{LUMO} (lowest unoccupied molecular orbital energy), the energy difference (ΔE) between E_{HOMO} and E_{LUMO} , dipole moment (μ) , electron affinity (A) , ionization potential (I) , the absolute electronegativity (χ) , absolute hardness (η) , softness (σ) , polarizability (α) , the Mulliken charges and the fraction of electrons (ΔN) transfer from inhibitors to iron, would be determined and correlated with the experimental %IE. Quantitative Structure Activity Relationship (QSAR) approach will be used and a composite index of some quantum chemical parameters performed in order to characterize the inhibition performance of the studied molecules. The aim of the studies is to find good theoretical parameters to characterize the inhibition property of the inhibitors and the correlation between the inhibition efficiency and the electronic properties using different methods and basis sets. Presently, some students have started work on the experimental aspect of the study using the AUTOLAB ELECTROCHEMICAL STATION acquired from METROHM, SA to obtain inhibition efficiencies of ten (10) furfural hydrazone derivatives, some penicillin compounds and some triazole, imidazoline derivatives. This project will further be strengthened by my collaboration with the Department of Chemistry, Kocaeli University in Turkey (his research collaborators) through the support of the TUBITAK fellowship to do further experiments and get more expertise on the theoretical and molecular modeling aspect of the work.

(b) Industrial applications of some of the compounds used as corrosion inhibitors – the overall aim of the work is to commission some graduate students in collaboration with CSIR to review the properties of the compounds used as corrosion inhibitors over the years and see the possibility of their industrial applications and to patent the work. Plans are already in progress. The project has great potential of strong growth given the local and national relevance and opportunity to expand the work in other areas.

(c) His third emerging / new area of research that is developing are “thermodynamics and excess molar volume studies of solutions”. The importance of this area is to study the thermodynamic properties of the solutions of the compounds intended

to be used as corrosion inhibitors before doing the electrochemical studies and experiments. The equipments used are ANTON PARR Refractometer, ANTON PARR Densimeter and ANTON PARR Stabinger Viscometer.

(d) Research on the potential use of **IONIC LIQUIDS** (environmentally friendly and green) as corrosion inhibitors.

(e) Olefin Metathesis Technology and Catalyst Design: Transformation of oil-derived olefinic compounds (oleochemicals), using olefin metathesis reaction, to fine chemicals and intermediates with potential application in the manufacturing of various niche/strategic market materials such as pharmaceuticals, detergents and polymers (polyesters, polyamides, polyethers, polyurethanes). Such molecular transformations require the use of transition metal catalysts like those based on Re, W, Ru, and Mo and as such development of highly active, selective and stable olefin metathesis catalysts forms the fundamental part of this research. Comparison of the reactions in conventional solvents and ionic liquids [Collaboration with Prof. Marvey (Mendusa) and Prof. Vosloo (NWU, Potchefstroom Campus)].

From all these projects listed, it is expected that in the next five years we should be able to train and graduate at least two (2) PhD, two (2) MSc and ten (10) honours students; involve at least one (1) postdoctoral fellow per research project and publish at least ten (10) papers per year in strong peer reviewed international journals with high impact factor and also patent one or two of the work. Currently, Prof. Ebenso has three (3) postdoctoral fellows in his research group in the Dept. of Chemistry of the Mafikeng Campus of NWU.

SELF ASSESSMENT OF RESEARCH OUTPUTS

The problem of corrosion has been a subject of concern for several years and this happens to be one of the major problems facing many industries in the world today ranging from the petroleum industries, mining industries and even to our everyday life. Several countries and industries all over the world have spent and allocated huge sums of money into the possibility of combating this corrosion menace. A lot of researches and researchers have been investigating the issue of how to reduce (if not combat) the problem of corrosion. A lot of compounds have been studied as possible corrosion inhibitors by several groups and this area of research continues to generate a lot of more interest over the years. He has investigated several compounds as corrosion inhibitors. He has used several plant extracts as corrosion inhibitors in his research due to the phytochemical constituents of the plants. The plants are also green and environmentally friendly compared to the synthetic compounds which most of the time are hazardous. The research into the use of plant extracts is also receiving attention by many researchers in the field of corrosion. He has contributed a lot to this area of research and his articles have been cited severally by other researchers in this field. Most of them have been cited 20 to 40 times and are published in journals with high impact factors. The growth of his research also led him to explore other compounds that contain oxygen, nitrogen and sulphur as corrosion inhibitors because these elements with lone pairs of electrons are possible sites of adsorption to materials. His contributions in this area have been cited over 50 times by other researchers as seen in SCOPUS search engine of Elsevier Science and other articles in Mater. Chem. Physics 60(1999) 79 - 90 has been cited over 70 times; Mater. Chem. Physics 40 (1995) 87 - 93 has been cited over 60 times as recorded too by the SCOPUS search engine of Elsevier Science. This shows strong evidence of the impact of how his research relates to others in his field. He has also used polymers as corrosion inhibitors and the papers published in this area too have received a lot of citations. The findings were published in Journal of Applied Polymer Science (2006 - 2009), Indian Journal of Chemical Technology (2008), Materials Chemistry and Physics(2007), Pigment and Resin Technology (2006). His research has created a lot of impact in his area of research and has led to being invited as reviewer to many journals in this area namely Corrosion Science, Materials Chemistry and Physics, Pigment and Resin Technology, Journal of Applied Polymer Science, to mention but a few.

The growth in his research moved to the use of quantum chemical and theoretical studies of compounds used as corrosion inhibitors. The papers generated from these areas have also been accepted and published in reputable journals with high impact factor like Corrosion Science, International Journal of Quantum Chemistry, Journal of Molecular Modeling and Journal of Applied Electrochemistry. The nature of the works published in these journals also led to his being invited as a reviewer and he has reviewed more than a hundred (100) research / review manuscripts in this area. His work in this field is seriously related to the latest and contemporary works and articles published in journals in this field. He also collaborates with some other research groups in other parts of the world where similar researches are going on. His research is contemporary and has potential industrial application to the local, national (South Africa) and the international community.

Prof. Ebenso is an ESTABLISHED NRF RESEARCHER IN CHEMISTRY (SOUTH AFRICAN NATIONAL RESEARCH FOUNDATION) – C1 RATING CATEGORY. He has an H-Index of 25 and 684 CITATION RECORDS in the SCOPUS Search Engine of ELSEVIER SCIENCE since 1996 (<http://www.scopus.com/authid/detail.url?authorid=6602852872>) and over 1652 references. He is currently the FOURTH MOST PROLIFIC AUTHOR IN THE FIELD OF CORROSION INHIBITION – content by **Scopus and powered by **NEXTBIO** (<http://www.hub.sciverse.com/action/search/results?st=corrosion+inhibition>).**

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