

Dr. Kamau Gachigi, Lecturer

Academic Background

- PhD in Solid State Science, The Pennsylvania State University (USA), 1996
- M.S. in Solid State Science, The Pennsylvania State University (US), 1993
- BSc. (Hons) in Materials Science, University of Bath (UK) 1988

Professional Work Experience

- RESEARCHER THE MATERIALS RESEARCH CENTER, TDK CORP, JAPAN 1996 - 1998
Research on thermal shock resistance in BaTiO₃-based ring varistors.
- RESEARCH ASSIGNMENT TRANSELCO DIVISION, FERRO CORP., USA MARCH 1995
Fabrication of Multi-layer chip capacitors in class 1000 clean room, including slip preparation, screen printing of electrodes, lamination, dicing and testing. Performed as part of PhD.
- RESEARCH ASSIGNMENT CENTER CAPACITOR INC., USA JULY – DEC 1994
Fabrication of Multi-layer chip capacitors in class 1000 clean room, including slip preparation, screen printing of electrodes, lamination, dicing and testing. Involved in binder-burnout, sintering and hot isostatic pressing studies. Performed as part of PhD research.
- SENIOR TECHNICIAN REDLAND TECHNOLOGY, HORSHAM U.K. OCT 1988-APRIL 1990
Initiated and responsible for two research projects on concrete roof tiles. Appointed in charge of Cement Group's personal computers.

Research interests

- Evaluation and novel processing of titanium bearing ores
- Activated Carbon from Agricultural Wastes
- Recycling of Plastic Wastes/Low-Cost Housing Materials
- Electroceramics – varistors, capacitors, piezoelectrics, insulators

Thesis Supervision

- Baruthi, O., PhD – *Recycling of Plastics Wastes*
- Baruthi, O. MSc - *Plastics Wastes in Kenya: A Survey*

Final Year Project Supervision

- Mechanical Properties of Biodegradable Polymers (PolyLactic Acid and Gum Arabic) 2004
 - Thermal and Mechanical Properties of Recycled Plastics Used in the Packaging Industry (LDPE, HDPE and PP mixtures) 2004
- Application of recycled Plastics in the Production of Lightweight Concrete 2004
- The Design of Test Equipment to Study the Behaviour of Dessicant Materials for Air Conditioning (set up used in the National Universities Public Exhibition, 2004) 2004
- Construction and Testing of Experimental Apparatus for Titanium Metal Production by Electrolytic Reduction 2003/4
- Production of Activated Carbon from Locally Available Raw Materials 2003/4
(Awarded best project in Faculty of engineering, 2003)
- Characterisation and Processing of Refractory Materials from Locally available Ores 2003

Teaching

- Materials Science and Engineering I: *atomic structure, crystallography, defects, properties...*
- Materials Science and Engineering II: *phase diagrams, metals, polymers, ceramics...*
- Materials Science and Engineering III: *fracture, visco-elasticity, corrosion...*
- Materials Processing I: *rolling, forging, extrusion, bending, drawing, punching, cutting...*
- Materials Processing II: *casting, welding, injection moulding, rapid prototyping...*
- Materials Science for Electrical Engineers: *atomic and crystal structure, electrical properties...*
- Solar Energy (Masters course) – *basics for photovoltaics and*

Publications

- E. Breval, K. wa Gachigi, C. Wang, and J. Dougherty, "PLZT Phases near Lead Titanate. I. Determination by X-ray Diffraction", J. Am. Ceram. Soc. 88 [2], 437-442, 2005
- K. Gachigi, P.M. Pruna, C.A. Randall, T.R. ShROUT, S.-J. Jang and J.P. Dougherty, "Temperature Dependence of Phase Stability in La^{3+} , Ca^{2+} and Ti^{4+} Modified $PbZrO_3$ Ceramics", Proceedings of the 9th International Meeting on Ferroelectrics (IMF-9), Seoul, S. Korea, Aug. 24-29th, 1997.
- K. Yamakawa, K. wa Gachigi, S. Troiler-McKinstry and J.P. Dougherty, "Phase Transitions of Antiferroelectric Lead Zirconate Thin Films in High Electric Fields", Ferroelectric Letters, vol. 20, pp. 149-155, 1996.
- R.P. Brodeur, K. wa Gachigi, P.M. Pruna and T.R. ShROUT, "Ultra-High Strain Ceramics with Multiple Field-Induced Phase Transitions", J. Am.Ceram.Soc., vol.77, no.11, pp.3042-44, 1994. (peer-reviewed)
- K. wa Gachigi, U. Kumar and J.P. Dougherty, "Grain Size Effects in Barium Titanate", Ferroelectrics, vol. 143, pp.229-238, 1993.
- K. wa Gachigi, S. Sato and T. Nomura, "On the Mechanism of Thermal Shock Resistance in SiO_2 -Modified (Ba,Sr,Ca) TiO_3 Ceramic Varistor", The Society of Materials Engineering for Resources of Japan, Akita City, Japan, June 24th, 1997.
- V. Sundar, K. wa Gachigi, D.M. McCauley, K. Markowski and R.E. Newnham, "Electrostriction Measurements in Diffuse Phase Transition Materials and Perovskite Glass Ceramics", Proceedings of the International Symposium on the Applications of Ferroelectrics (ISAF), The Pennsylvania State University, 1994.
- K. wa Gachigi, "Crack Detection in Green Ceramics Using Ultrasonic NDT and Artificial Neural Networks", presented at weekly Ferroelectrics seminar at MRL, The Pennsylvania State University, Fall, 1994.
- K. wa Gachigi, A.Bhalla and L.E. Cross, "Measurement of Piezoelectric Coefficients Using Double Beam Laser Interferometry", presented at the Am.Ceram.Soc. conference in Cincinnati, Ohio, Spring, 1991.

Patents

- J.P Dougherty, K. wa Gachigi, T.R. ShROUT, S.-J. Jang, C.A. Randall and P.M. Pruna, "Cardiac defibrillator with multi-phase ferroelectric/antiferroelectric capacitor", U.S. Patent No. 5,728,138. MARCH 17, 1998

Non-Technical Publications and Presentations

- Kamau Gachigi, James Kibera, Jones Mugambi, Benedict Munanga, "Alternative Approach to

Mining of Heavy Minerals in Kenya, produced in partnership with the International Fund for Animal Welfare (IFAW). May 2002

- Kamau Gachigi, *"Increase in Electrical Energy Storage Density for Miniaturisation of Implantable Medical Device"*, Kenya Engineer, p.26-29, vol. 21, no.2, 2000.
- Kamau Gachigi, *"Materials Science and Device Technology Conference held at University of Nairobi"*, Kenya Engineer, p.29, vol. 21, no.5, 2000.
- Kamau Gachigi, *"Novel Solar Cell Technology"*, Kenya Engineer, p.16-18, vol. 21, no.6, 2000.
- Kamau Gachigi, *"The Value of University-Industry Collaborative Research Case Study – Increase of Electrical Energy Storage Density For Miniaturisation of Implantable Medical Device"*, Kenya Engineer, vol.21, no. 2, p.26-29, 2000. (The KENYA ENGINEER is the publication for the Institute of Engineers, Kenya)
- Presentation on campaign for responsible titanium mining in Kenya, Kamau Gachigi to **The Tuesday Group** (*an environment focus group comprising about 50 NGOs and US government agencies. Meeting held at World Wildlife Fund Offices, Washington DC.*) JAN 9TH , 2001

Consultancy

- **INVESTIGATION OF TITANIUM ORE DEPOSITS AT KENYAN COAST** DEC 2003 - present
Project initiator and principal investigator, Budget = US\$30,000. Sponsored by Action Aid Kenya and Environmental Liaison Center International
- **ANALYSIS OF RUPTURED PLASTIC WATER TANK (INSURANCE DISPUTE)** 2002
Sole investigator – for local insurance company versus local plastics manufacturer (though tank was manufactured in Sri Lanka, therefore tested against Sri Lankan standards).
- **ANALYSIS OF FRACTURED CONNECTING ROD (INSURANCE DISPUTE)** 09/2000
Sole investigator – for Peter Huth Insurance Assessor on behalf of Swift Truckers, Ltd.
Analysed cause of failure in connecting rod from Isuzu lorry.
- **INVESTIGATION OF TITANIUM ORE DEPOSITS AT KENYAN COAST**
Campaign against irresponsible Ti-ore mining in Kenya while in US for Action Aid USA and Action Aid Kenya. 01/2001

Awards and Honours

- Patron, **Students Association of Mechanical Engineers (SAME)** 2003 to present
- **National Mineral Sector Conference Steering Committee** member – Government Investment Promotion Center and Kenya Chamber of Mines 2004 to present
- Appointed to **Rhodes Scholarship Selection Committee**, Nairobi 2002 to present
- Selected to represent Civil Society as technical expert on national investigative team on titanium mining in South Africa, led by Assistant Minister for Environment and Nobel Prize Laureate Prof Wangari Maathai sent to sent to. Toured Ticor SA, guests of SA govt. 2002
- Inductee, Phi Kappa Phi Honour Society, USA 1993