

LAUTECH Nanotechnology Research Group
...Enabling Qualitative Research at the Smallest Scale

**Prof. A. Lateef, Head of NANO⁺,
LAUTECH, Ogbomoso**

It is my pleasure, on behalf of NANO⁺ to welcome everybody to this gathering, the first of its kind in the annals of the research group. I would set out to thank everyone that has contributed towards making today's occasion a reality; putting the almighty God first for the enablement to organize this epoch-making workshop. The workshop on nanotechnology can't come at a better time than now, when the revolution in the science and technology of nanomaterials has pull down all barriers separating materials science from other disciplines such as medicine, agriculture, life sciences, environmental sciences and commerce. *Ab initio*, materials science has played prominent roles in developments in physical and chemical sciences, engineering and technology, and built environment. Therefore, it becomes imperative for us, as a nation to tap into the growing opportunities offered by nanotechnology to leverage developmental agenda to foster peace and progress in our country. Thus, the theme of this workshop, 'Nanotechnology: key to sustainable development and national integration' was coined to stimulate our thinking in incorporating tools of nanoscience and nanotechnology into our research activities in our efforts to develop the nation.

Basically, nanotechnology deals with design, synthesis and manipulation of particles or structures within the range of 1-100 nm. This small size gives nanomaterials the remarkable properties they possess, which is largely attributed to high surface area to volume ratio. While nanostructures have been in existence from the time immemorial; scientists recently began to understand their behaviour. The nanotechnologists are now using this knowledge to control their properties, and creating arrays of functional materials for subsequent applications in diverse areas of agriculture, medicine, science and engineering. Examples of nanomaterials are nanoparticles or nanocrystals made of metals, semiconductors, or oxides as well as those of inorganic materials such as quantum dots, nanowires and nanorods or nano-carbon materials such as graphene, carbon nanotube among others. Remarkable growth in this evolving technology has unlocked innovative, fundamental and applied cutting-edge research, ranging from the synthesis of nanoscale materials, utilization of their exotic physicochemical and optoelectronic properties. The applications cut across all facets of human endeavours.

In this workshop, participants would listen to renowned experts in this emerging field; who would treat various aspects of sub-themes of the workshop. We have invited the first Nigerian Professor of Nanotechnology, Prof. E.O. Dare from the Department of Chemistry, FUNAAB, Abeokuta, and Associate Professor M.G. Zebaze-Kana from the Department of Materials Science and Engineering, KWASU, Malet, Kwara State as keynote speaker and guest lecturer, respectively. These are erudite scholars who have carried out deep-rooted investigations in different areas of nanotechnology. I am confident that participants would gain tremendously from their presentations. Some other lectures would be delivered by members of the research group, while

practical sessions on synthesis and applications of nanoparticles would also be conducted. I urge you to take this advantage, and tap in to the opportunities embedded therein.

NANO⁺ was formed on September 4, 2014 to advance the course of research in the multidisciplinary subject of Nanotechnology at Ladoke Akintola University of Technology, Ogbomoso, Nigeria. Hitherto, there seems not to be any virile research group in this area in the University. However, the University is endowed with scholars who have been trained or shown keen interests in this emerging discipline. Therefore, the pioneer members were propelled by quest to conduct meaningful research in this area, and also to train manpower, thereby putting LAUTECH in a vantage position in Nanotechnology Research in Nigeria. The group has the vision of transforming LAUTECH to a centre of excellence in Nanoscience and Nanotechnology in Nigeria.

The group has drawn membership from dedicated young scholars from different Departments within the University; with advanced training in Molecular Biology, Industrial Microbiology, Biotechnology, Nanotechnology, Toxicology, Biochemistry, Renewable Energy, Materials Science and Engineering and Nanofabrication. The group aimed at contributing to the growth of the University through Research and Training, while it is poised for collaborative research involving individuals, groups, institutions and industries. We have collaboration with scholars from University of KwaZulu-Natal, Pietermaritzburg, South Africa, and King Fahd University of Petroleum and Minerals, Saudi Arabia. The scientific meeting of the research group takes place monthly to discuss research activities within the mandate of the group. The 31st scientific meeting was held on 03 August, 2017.

While the pioneer members are *Prof. A. Lateef, Dr. M.A. Azeez, Dr. T.A. Yekeen, Dr. T.B. Asafa, Dr. A. Akinboro, and Dr. I.C. Oladipo*; the group admitted *Dr. E.A. Adebayo and Dr. Y.K. Sanusi* to its fold on February 12, 2016 after rigorous selection exercise. Furthermore, *Dr. M.O. Durowaju, Dr. O. Adedokun and Dr. J.A. Badmus* were admitted to the group on June 23, 2016. Members spread across the three existing sub-divisions viz Biological/Biomedical, Physical/Chemical, and Engineering/Technology cluster groups.

Modest achievements of the group

1. Membership of the research group increased from pioneer members of six to eleven distributed in the Departments of Pure and Applied Biology, Pure and Applied Physics, Science Laboratory Technology, Biochemistry, and Mechanical Engineering of the University.
2. The group launched its website (www.nanotech.lautech.edu.ng) on 24 June, 2016, which was designed to propagate the work of the group, and also to promote the good image of the University as a centre of excellence in research.
3. Establishment of antimicrobial, larvicidal, antioxidant, dye-degradation, anticoagulant, and thrombolytic (dissolution of blood clots) activities of silver, gold, and silver-gold alloy nanoparticles biosynthesized using plant, arthropod and bacterial extracts, leading to joint publication of ten articles by the pioneer members of the group, and several others by individual members in the area of nanotechnology (check <http://lautechnanotech.com/files/publication.php> for full list).
4. Since its formation, members of the group have published twenty-one (21) quality research outcomes focusing on silver, gold, silver-gold alloy nanoparticles in reputable Journals with renowned publishing outfits such as SPRINGER, ELSEVIER, DE GRUYTER and IEEE.

5. Collaboration with scientists from several Universities in Nigeria, University of KwaZulu-Natal, South Africa, King Fahd University of Petroleum and Minerals among others.
6. Training of several undergraduate and postgraduate students in this emerging field. At least, three M.Tech graduates had their work focussed on different areas of nanotechnology

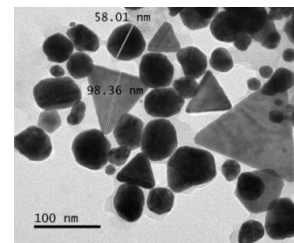
In the future, we shall conduct summer classes for science students in secondary schools, as well as organization of annual conference on nanoscience and nanotechnology. So, be on the lookout.

Appreciation

Firstly, I thank the management of the University (past and present), for the various supports that members of the research group have received in their career. It would interest us to know that all members of the group, except Dr. J.A. Badmus are ex-students of LAUTECH, having obtained either first or higher degrees from the University. We say kudos to LAUTECH! We acknowledge the acquisition of state-of-the-art equipment at Central Research Laboratory, hoping that the equipment would be installed soon at the new building of the laboratory. To drive cutting-edge research in nanotechnology and other allied disciplines, the University must invest in the acquisition of equipment such as XRD, SEM, TEM, AFM, TGA etc. I also wish to thank our teachers and senior colleagues for their mentorship and support at all times. May I single out the Vice-Chancellor, Prof. A.S. Gbadegesin for his love, my emeritus supervisor, Prof. J.K. Oloke, *NPOM*, for the sound training that I received under him and Prof. S.O. Jekayinfa for the support in establishing my research laboratory. I serve as the chief servant for the worthy members of the research group, whom I'm grateful for their cooperation at all times. I'm highly indebted to my friend, Dr. M.A. Azeez, who persuaded me in 2013 to have a shot at Nanobiotechnology. I appreciate you sir. Our deep appreciation goes to Prof. E.B. Gueguim-Kana and Ms. L.S. Beukes of University of KwaZulu-Natal, South Africa for the outstanding working relationship on nanotechnology research. In the same vein, we are thankful to Dr. S.H. Abbas of the Centre of Excellence in Nanotechnology (CENT) at the King Fahd University of Petroleum and Minerals (KFUPM), Kingdom of Saudi Arabia for the superb collaboration. To our numerous undergraduate and postgraduate students, we salute your courage and steadfastness to be part of the journey in nanotechnology research. All our collaborators and colleagues, and other well-wishers are equally appreciated for the words of encouragement and the constructive criticisms. We shall strive to improve at all fronts towards achieving excellence in our activities. I specially recognize our colleagues from Osun State University, Osogbo ably led by Dr. L. Azeez. This is a group of researchers that are being mentored by our research group to establish a similar group at UNIOSUN. We recognize the support of our sponsors, as we deeply value your partnership in promoting academic discourse. We solicit for more support, in terms of funding to expand the scope of our research activities. Finally, our special greetings and appreciation are due to the members of *NANO*⁺ family for their support, love and care.

Mr. Vice-Chancellor, Deans of Faculties of Pure and Applied Sciences, and Engineering and Technology, other Deans, Professors, Distinguished invited lecturers, guests, participants, students, pressmen and all well-wishers, it is my pleasure once again to warmly welcome you to the first workshop on nanotechnology organized by *NANO*⁺.

Thank you.





Prof. O.M. Oni, Dean, Faculty of Pure and Applied Sciences, LAUTECH, Ogbomoso.

Nanotechnology has no doubt proven the wide applications of nanoparticles. All sectors of human endeavour have witnessed tremendous growth since the adoption of nanotechnology. In this part of the world, despite the wide applications, synthesis and characterization of nanoparticles are not common procedures among the early and emerging researchers. It is therefore very necessary and timely too, to have this workshop which has promised a hands-on approach in the teaching and transferring of the necessary and required skills in synthesizing, characterizing and applying nanoparticles.

I am very confident that the organizers are up to the task, bearing in mind the calibre and quality of human and material resources comprising and within the reach of the *NANO*⁺ research group of the Ladoke Akintola University of Technology (LAUTECH), Ogbomoso. It is also heart-warming that the research group is firmly rooted in the Faculty of Pure and Applied Sciences, which is prized as the gateway to this University. Kindly permit me at this juncture, Ladies and Gentlemen, to implore the participants to make judicious use of this opportunity to understand the nitty-gritty of all processes and procedures to synthesize and characterize nanoparticles for various applications. Kindly adopt the Do-it-yourself (DIY) approach.

On this note, on behalf of the Faculty of Pure and Applied Sciences, I am happy to have you attend this workshop and I heartily congratulate the organizers, for their vision, interest and readiness to transfer knowledge through this laudable workshop being held here today.

Thank you.



Prof. K.A. Adebiyi, Dean, Faculty of Engineering and Technology, LAUTECH, Ogbomoso.

Let me join my voice to that of the organizers in welcoming you to this august occasion. There is no better time to have this program than now because we are in a dynamic world and in fact a global village. You won't believe it that somebody somewhere may also be having the idea of organizing a similar programme. So by having it today we have been able to beat others to it and likely be the first to organize Nanotechnology workshop today the 22nd of August 2017.

The world is leaving the era of big for nothing, big and less efficient to that of small and more efficient “*AKERE KORO*”. Miniaturization of everything; something portable and highly efficient. It is not news again that at the nano level properties of materials are very much improved compared to that at the micron level. In fact, in some cases, some materials have different behaviours, entirely different from what they have at other levels. Meaning that with the use of nanoparticles entirely new materials can therefore be produced and great improvement can be achieved in some other materials when reinforced with other nanoparticles.

From the above, it can therefore be deduced that with this workshop, brilliant ideas that will lead to the production of new materials and products are likely to emerge. Nanotechnology cuts across virtually all disciplines of human endeavor. In agriculture, it has led to increase in the yield of farm produce and minimization of pest and insect attack. In sciences, improvements in the quality and performances of products have been recorded when silver and copper nanoparticles synthesized from different sources are added. Similarly, in engineering and technology, various improvements in the properties of materials and composites have been published after the introduction of nanoparticles. I have no doubt in my mind that after this workshop you would have learnt a lot about the synthesis of nanoparticles from different sources and also their applications.

I therefore salute the courage of members of Nanotechnology Research Group (*NANO⁺*), for their innovative efforts in this area of knowledge. I am also delighted about the multidisciplinary focus of the group, with the membership extended to some members of my faculty. Again, I warmly welcome you all to this workshop and wish you the best from the deliberations.

Thank you and God bless you.



Prof. A.S. Gbadegesin, Vice-Chancellor, LAUTECH, Ogbomoso



On behalf of the University, I welcome you to the maiden workshop of *NANO*⁺ tagged ‘Workshop on synthesis, characterization and application of nanoparticles’, and by extension to LAUTECH, Ogbomoso, Nigeria. Today is a memorable day in the life of the University; that despite the crisis that have rocked the University in the last one year, our scholars have proved their unrelenting mettle to put cutting-edge research at front burners. I am particularly delighted that the temporary set-back did not deter the organizers of this programme to forge ahead in promoting the good image of the University through research. To *NANO*⁺, I say kudos to you.

Nanotechnology is a multidisciplinary subject that is concerned with the fabrication, manipulation and application of materials at nanoscale level (10^{-9}), which encompasses studies in materials science, physical science, engineering, life sciences and medicine. The miniaturization of materials that are accompanied with profound changes in physical, chemical, optical, electrical, and magnetic properties has influenced the cosmopolitan applications of nanomaterials in virtually every aspect of human endeavours; ranging from electronics, control of vectors of diseases, solar panels, bioimaging, sensors, pollution control, agriculture, disease control, cancer therapy, diagnostics, cosmetics and other personal care products, food technology, water treatment, drug delivery, prosthetics etc. The technology has a lot of benefits for the developing nations, of which Nigeria can be a key player to combat the myriads of problems confronting the developing countries, as succinctly captured in the theme of this workshop ‘*Nanotechnology: key to sustainable development and national integration*’. It is therefore heart-warming that LAUTECH is set to play its role in this area through the formation of a virile research group.

The Nanotechnology Research Group (*NANO*⁺) at LAUTECH, was formed to advance the course of research in the multidisciplinary subject of nanotechnology that is at low ebb in the country. Members have the zeal to conduct meaningful research, and also to train manpower in nanotechnology. The group, which is led by Prof. A. Lateef, has the vision of transforming LAUTECH to a centre of excellence in Nanoscience and Nanotechnology in Nigeria, and this they have partly exhibited in publishing twenty-one (21) research articles in reputable Journals in about three years. We are pleased that substantial parts of these investigations were carried out using the facilities in the University, with advanced microscopic analyses done in the laboratories of their collaborators in South Africa and Saudi Arabia. The organization of this workshop is a further testimony to the realization of the lofty objectives of the group.

On our part, we shall continue to invest in the provision of equipment that would spur cutting-edge and translational research, and support research of this nature. Most recently, the University has acquired FTIR spectrometer, AAS, and HPLC, while an ultra modern Central Research Laboratory building has been built. I therefore congratulate the organizers and participants for this epoch-making event. I am fervently optimistic that attendance at this workshop would drive a paradigm shift in our research activities. It is therefore my pleasure to declare the workshop open to the glory of God and service to humanity.