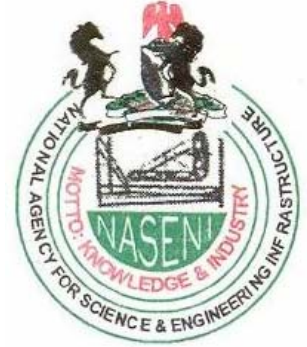


Status of Nanotechnology in Nigeria- Prospects, Options and Challenges



Presented by

PROFESSOR O.O.ADEWOYE FMSN, FNSE, FAEng, FAS

DIRECTOR-GENERAL/ CHIEF EXECUTIVE

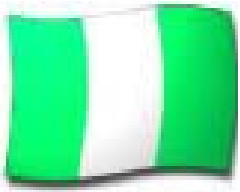
**NATIONAL AGENCY FOR SCIENCE AND ENGINEERING
INFRASTRUCTURE (NASENI) ABUJA**

AT THE

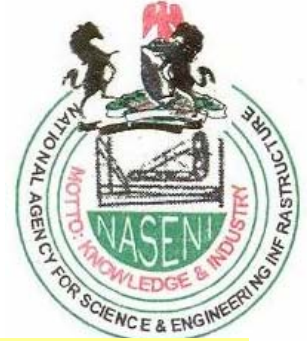
**SIXTH MEETING OF THE INTERGOVERNMENTAL FORUM
ON CHEMICAL SAFETY (IFCS)**

Dakar, Senegal

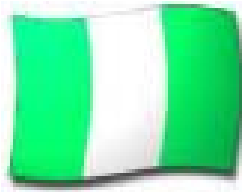
15 – 19 September, 2008.



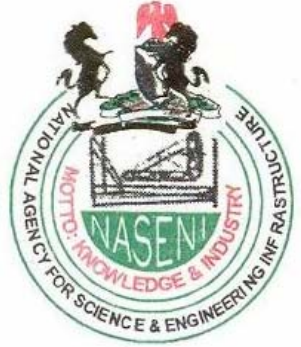
INTRODUCTION TO NASENI



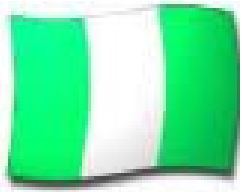
- o The National Agency for Science & Engineering Infrastructure (NASENI) is a parastatal under the Federal Ministry of Science and Technology.
- It controls 7 fully equipped research institutes/centres spread all over the country capable of using Advanced and Virtual Manufacturing Technologies.
- NASENI's mission is to establish and nurture an appropriate and dynamic Science and Engineering Infrastructure base for achieving home initiated and home sustained industrialization process through
 - (i) the development of relevant processes,
 - (ii) appropriate local machine design and
 - (iii) machine building capabilities for capital goods and
 - (iv) equipment manufacture.
- It has a solar panels manufacturing plant



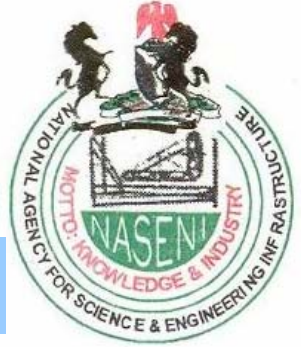
Nanotechnology in Africa



- **Within Africa, the initial activities in nanotechnology started in South Africa with two nanotechnology innovation centres and a plan to invest \$US74m on nanotechnology equipment, laboratories and University curricula.**
- **Other places where nano-activities are going on in Africa are;**
 - **Nigeria (launched in 2006)**
 - **Cameroon (launched in 2007)**
 - **Ghana (launched in 2008)**



NIGERIA NANOTECHNOLOGY INITIATIVES

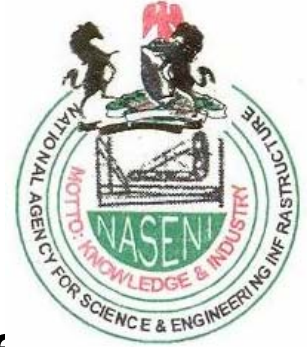
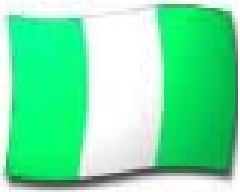


- ❖ **A Nanotechnology workshop was organised by NASENI and supported by USAMI in Abuja in 2006 where**

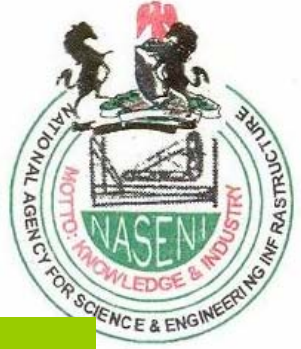
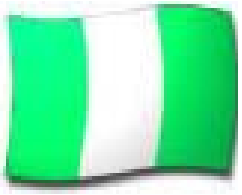
Viable options,

R & D Infrastructures and

Continue Education Modules were established.



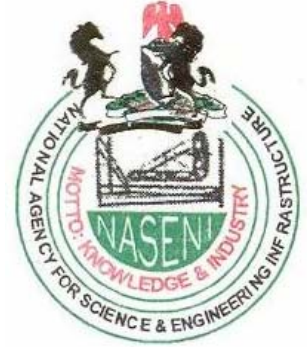
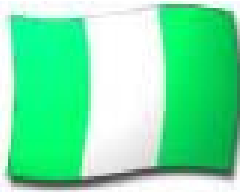
- ❖ 4 major areas relevant to the country's needs were targeted, namely;
 - **Nano-medicine** (for disease detection and treatment)
 - **Nano-energy** (solar cells and light emitting diodes)
 - **Nano-biology** (in agriculture for production of drought resistant seeds, food preservation and genomics)
 - **Nanoporous materials** (production of nano-porous filters for water purification and bio-oxidants)



Achievements

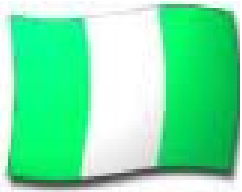
so

far

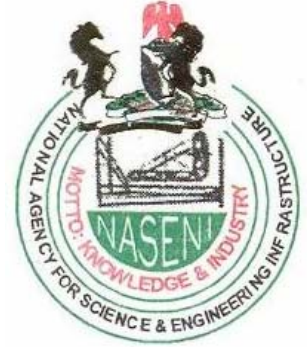


Through the communiqué that resulted from the workshop

- **The president now officially supports Nanotechnology as the 4th Area of National Focus in S & T**
- **NASENI has been mandated to coordinate Nanotechnology activities in the country**
- **A Centre for Nanotechnology & Advanced Materials has therefore been approved with a desk at NASENI**



OPTIONS



Creation of 3 nuclei in niche areas that will metamorphose into a formidable nanotech research group

Nanoporous and Nanostructured Materials

Chairman- Prof. P. B. Onaji (FUT – Yola)
Scribe - Dr. M. O. Adeoye (OAU)

Focus on water purification

Nanoelectronics

Chairman- Dr. B. Babatope (EMDI, Akure)
Scribe - Dr. (Mrs) R. U. Osuji (UNN)

Focus on LED's & solar cells

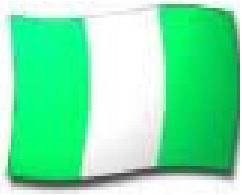
This group is already active

- **Plastic based solar cells at EMDI**
- **Nanosilicon at UNN**
- **MOCVD at OAU**

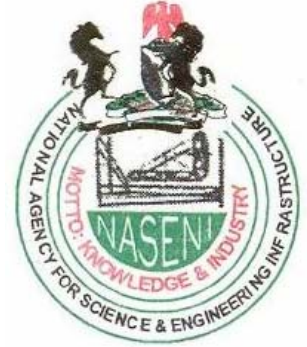
Nanomedicine

Chairman- Prof. G. B. Ogunmola (UI/NAS)
Scribe - Dr. E. O. Denenu (FMST)

Target cells of diseases like HIV, malaria, cancer and sickle cell



PROSPECTS

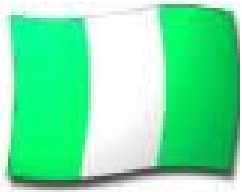


3 Nano-programs have been established namely;

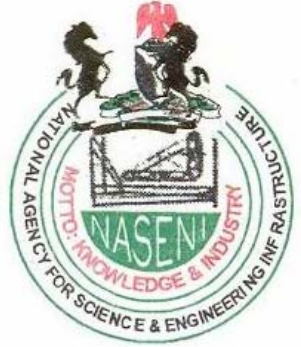
(i) Nanoparticle Production Training Workshop

(ii) NASENI Nano Visiting Research Fellows

(iii) Nano Research Grant



(i) Nanoparticle Production Training Workshop



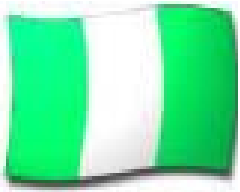
Aim: To increase nanotechnology and nanosciences awareness within the country and to have a critical mass of nano-experts in the established niche areas within next 5 years.

Under this workshop held on the 14th and 15th of August in one of the Institutes being supervised by NASENI

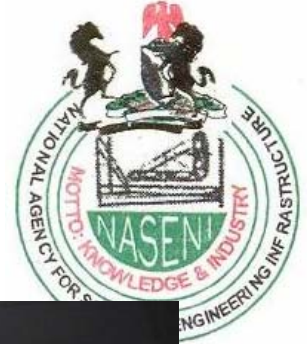
20 participants from different disciplines and 2 trainers were selected from national universities and research institutes for this training.

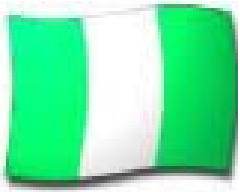
Nano-areas covered in the training includes mixed semiconducting, silver, capped TiO₂ and magnetic nanoparticles through sol-gel and wet chemistry methods.

The training will run every year for the next 5 years.

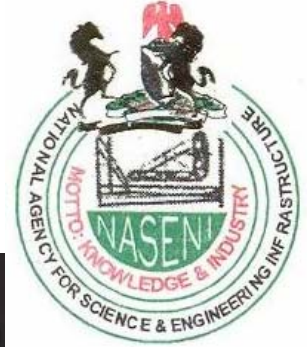


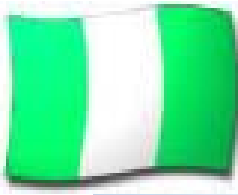
THE COORDINATOR ADDRESSING THE PARTICIPANTS



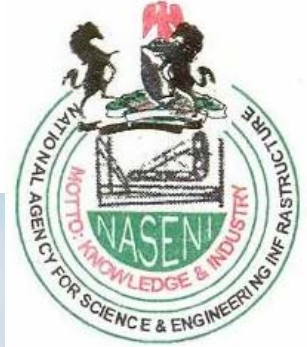


THE DIRECTOR GENERAL ADDRESSING THE PARTICIPANTS

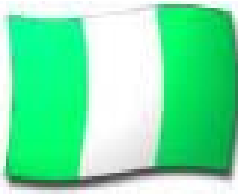




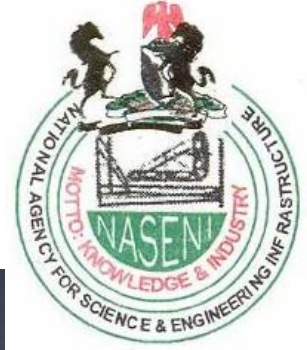
PARTICIPANTS AT THE WORKSHOP

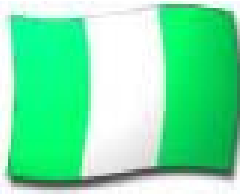


**Physicists,
Chemists,
Pharmacists,
Engineers,
Food technologists**

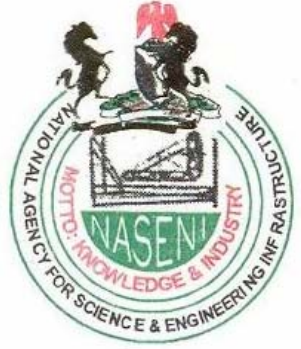


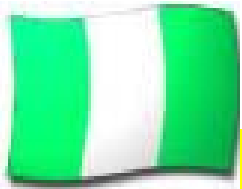
TYPICAL RESULTS OBTAINED – SILVER NANOPARTICLES



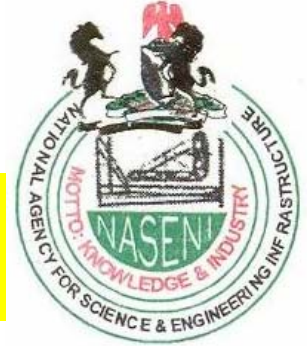


TYPICAL RESULTS OBTAINED – MAGNETIC NANOPARTICLES





(ii) NASENI Nano Visiting Research Fellows



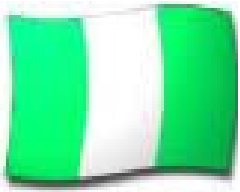
Aim: To allow employed academic researchers and PhD students working in the areas of nanotechnology and nanosciences to take research leave from their respective institutions and come to one of NASENI's institutes to carry out **result-oriented** research within a period of 3-6 months.

Presently, due to limited funding, 4 researchers can visit at a time, meaning that we can have 8 researchers in a year

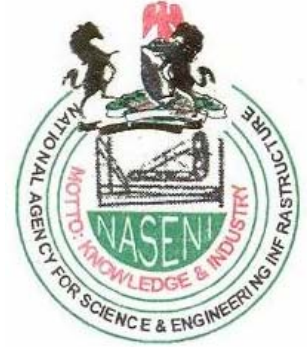
Facilities provided for the visitors include

- (i) Accommodation
- (ii) Transportation
- (iii) Stipend depending on their salary levels in their institutions

The duration of this program is indefinite



(iii) Nano Research Grant

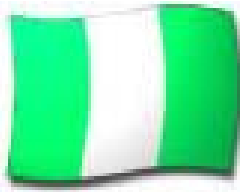


Aim: Permit researchers to submit proposal aimed at using nanotechnology for solving national problems in the niche areas of water purification, medicine, agriculture and energy.

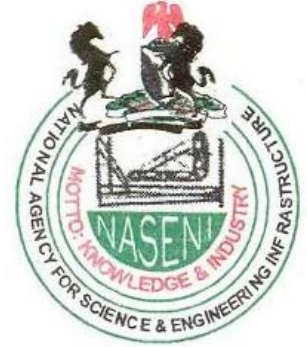
Again due to limited funding, successful applicants will be given a grant for 1 year.

The 1st series of grants will be awarded next month for 2 proposals.

The number of awards will increase as funding increases and we are positive about this.



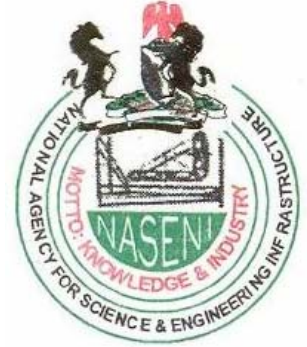
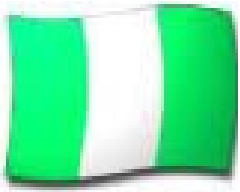
AVAILABLE EQUIPMENT FOR NANO-RESEARCH



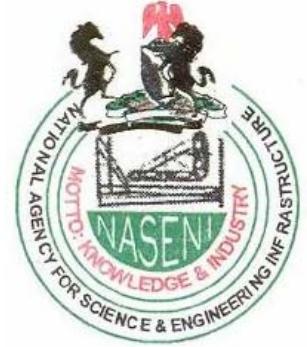
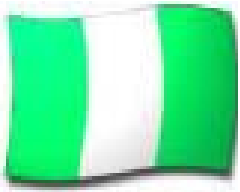
Establishment of a Nanoelectronics laboratory at the Engineering Materials Development Institute, Akure.

Equipment available for nano-studies include;

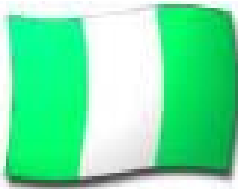
- ✓ **Advanced technology microscope,**
- ✓ **4- point probe with kaithley source meter**
- ✓ **Computerized uv-visible spectrophotometer,**
- ✓ **Computerized x-ray Diffractometer (XRD),**
- ✓ **Computerized microhardness tester,**
- ✓ **Spin coater,**
- ✓ **computerized table-top Instron universal tensile tester**



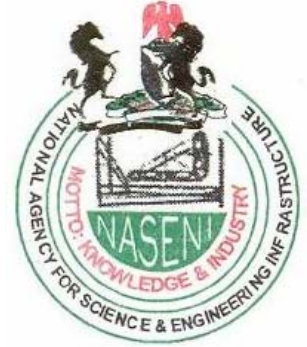
- ❑ **Due process for the purchase of tunable laser from the African Laser Centre (ALC) in South Africa suitable for materials characterization in the areas of micro-Raman and photoluminescence analyses is underway.**



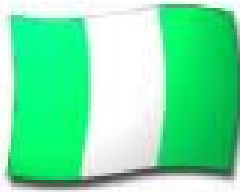
- ❑ **World Bank Project – Science and Technology Education Post Basic (STEPB)**
 - **We submitted 5 proposals**
 - **Proposal on Capacity Building in Nanotechnology has been approved**
 - **Sponsorship to the tune of \$US6m**
 - **Waiting for take off grant.**
 - **Good signals.**



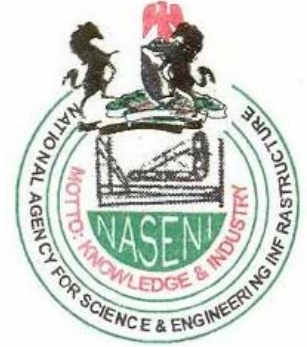
Planned workshops for the African-MRS



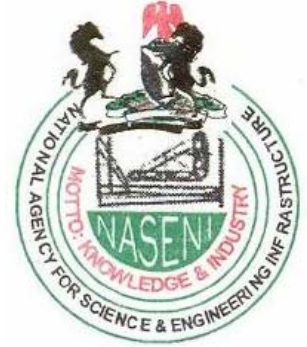
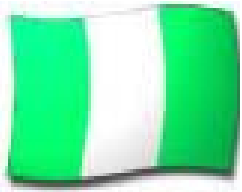
- ❖ **With me as the new president of the A-MRS for the next 2 years, our major plan is**
- ❖ **To increase Nanotechnology awareness and other important aspects of technological advancement through**
- ❖ **5 workshops that will be organised to take place in different regions of Africa within those 2 years.**
 - **Bio-nanotechnology – Egypt (lectures & demo)**
 - **Nanoenergy (polymer electronics) – Ethiopia (lectures & demos)**
 - **Nanotechnology – South Africa (workshop)**
 - **Nano-Infrastructure for Affordable Housing – Ethiopia (lectures and demos)**
 - **Foundry Tech –Nigeria & Egypt (workshop and demos)**
 - **Advanced Manufacturing Technology – Nigeria (lectures & demos)**



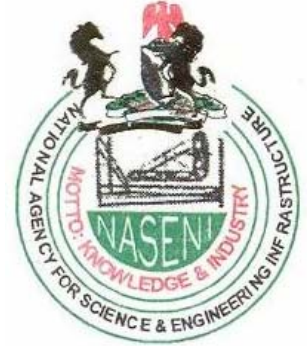
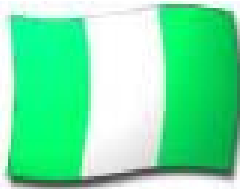
CHALLENGES



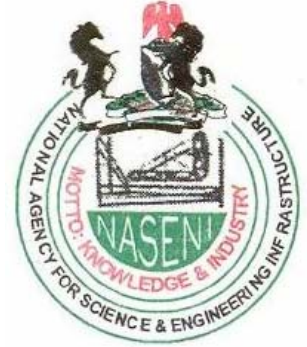
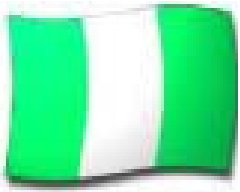
- ❖ building on our existing strengths in people and resources through interactions between Nigerians at home and abroad,
- ❖ creating linkages between universities, research institutes and industry in Nigeria,
- ❖ visibility to all Nigerians across the country in terms of making their contributions and
- ❖ the development and dissemination of nanotechnology by coordinating the interactions between scientists and engineers working at multiple centers.



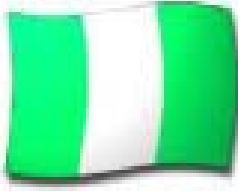
- ✓ **Create number of experts and research findings with tangible results in areas of nanotechnology for industrial applications.**
- ✓ **Integration of nanotechnology in University curriculum for sustainable capacity building.**
- ✓ **Establishment of a functional Centre for Nanotechnology and Advanced Materials (C-NAM) for sustainable capacity development.**
A desk has already been created at NASENI.
- ✓ **Triggering a large number of industrial activities resulting in a vibrant and expanded market opportunity through nanotechnology applications.**



	2003 nanotech funding (in millions of dollars)	Percent from national government
Japan	1,610	50
U.S.	1,524	51
China	480	58
South Korea	280	71
Germany	218	54
Australia	193	48
U.K.	160	56
Taiwan	115	35
France	90	56
Israel	50	40
India	45	44
Finland	33	55
Canada	31	52
Singapore	30	50
Other	685	50
World total	5,544	52



In conclusion, the only factor limiting active nanotechnology participation in Africa is lack of adequate funding for equipment purchase and sustainability.



Thank you for listening

