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Biography of the Distinguished Professor Adebowale Kayode

Background, Personal Life and Discoveries

Professor Adebowale journeyed into this world on the 11th day of January, 1962 into the family of late Mr Liasu and Mrs Mopelola Adebowale, of Ile Lan-nisa, Ita Okoro, Isale-Ijebu, Ibadan, Oyo State, Nigeria. His Research over the years has made remarkable contribution in the area of food chemistry. Some of his discoveries and fundamental results include but not limited to:

- Scrutinizing the functional properties of native, physically and chemically modified fruits
- Proposed that J. curcas is a viable candidate for incorporation into pest control program of grain legumes
- Analyzed the effect of some operating variables on the adsorption of lead and cadmium ions on kaolinite clay. He discovered that the modification of kaolinite clay mineral with orthophosphate (p-modified sample) enhanced adsorption of Pb and Cd ions from aqueous solutions of the metal ions
- Discovered that phosphate-modified adsorbent has the potential of holding heavy metal ions from industrial waste waters even in the presence of low concentrations of electrolytes

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1. Education

From 1967 to 1972, Adebowale did his primary education, a program that he commenced at the Saint Marks School, Oke-Ijaga, Ijebu-Igbo, continued at Shokoya Memorial Wesley School, Sagamu and completed at St John's Primary School, Ikire. . He had to attend three different primary schools on account of the frequent transfer of his father.

He went on to attend Ayedaade Grammar School, Ikire, between 1973 and 1978 for his secondary school education. In search of knowledge, He proceeded to the prestigious University of Ibadan in September 1980 and obtained a Bachelor of Science degree in Chemistry in June 1984.

He partook in the National Youth Service Corps (NYSC) Scheme, where he carried out his primary assignment at the Community Secondary School, Ibiaku-Uruan, Uyo Local Government in the former Cross River State (now Akwa Ibom State), Nigeria from 1984 to 1985.

Immediately after his compulsory national youth service programme in 1985, Adebowale went on to enroll for Masters degree programme at University of Ibadan. Moreover, in 1986 he earned his M.Sc. degree in Industrial Chemistry and PhD in Industrial Chemistry in October 1991 respectively.

2. Administrative Life

Professor Adebowale is not just a teacher cum researcher, he also doubles as an administrator. He is a seasoned administrator with an unparalleled track record of excellence. He has held a number of administrative positions at the University of Ibadan and he has equally served meticulously and devotedly on many committees. These include:

- Postgraduate Coordinator, Department of Chemistry, 2000 to 2002.
- Examinations Officer, Department of Chemistry, 2003 to 2005.
- Sub-Dean (Postgraduate), Faculty of Science, 2002-2004.
- He was later elected Unopposed as Dean, Faculty of Science and he served in that capacity from 2009 to 2011.
- Member, Committee of Provosts and Deans, from 2009 to 2011.
- Member, Committee on the Appointment of Emeriti Professor (2012 to 2017);
- Member of Senate (2008 to date);
- Member of the Board of the Centre for Social Orientation (CENSO) and Chairman Committee on Research and Intelligence, CENSO (2012 to date).

He was also the Convener, Investigative Panel on the Determination of Class of Degree of two students in the Department of Mechanical Engineering in year 2013. The affected students had threatened to take the University to court but after a dispassionate investigation, the Adebowale Panel was able to resolve the matter harmoniously.

After this landslide resolution accomplished, in 2014, he was again Chairman and Convener of a Fact Finding Committee on a litigation instituted against the University of Ibadan by a leading architectural firm and his efforts saved the University funds and a protracted litigation.

Professor Adebowale was Director, Special Duties, Office of the Vice Chancellor, from 1st December 2015 to February 2017, and some of the innovative measures he introduced have led to a considerable reduction in the processing time of the promotion of his colleagues to the grade of Reader and Professor.

He subsequently attended the Senior Executive Course (Sec) No. 39, 2017 from the National Institute for Policy and Strategic Studies, Kuru, near Jos, which led to the award of the Member of the National Institute (MNI).

On account of his unequaled administrative capacity, He was appointed Deputy Vice-Chancellor (Administration), on June 2018, a position he still occupies. Consequent upon his promotion as the Deputy Vice Chancellor (Administration), he serves on the following boards, committees and panels. He is a

- Member, University Governing Council
- Member, Finance and General Purposes Committee of Council
- Member, Projects Committee of Council
- Member, Appointments and Promotions Committee for Academic Staff
- Member, Appointments and Promotions Committee for Senior Staff (Non-Teaching)
- Member, Senior Staff Disciplinary Committee
- Member, Students Disciplinary Committee
- Member, Tenders Board
- Member, Board of University of Ibadan Endowment Fund
- Member, Development Committee

He Chairs the following: Tender Analysis Committee, Project Monitoring Committee, Internal Revenue Board, Vehicle Refurbishing Loan Committee, Board of Centre for Social Orientation (CenSO), Board of Survey, and University Cleaning and Sanitation Committee, amongst many others.

To upgrade facilities in the Halls of Residence, the University of Ibadan designed the 2019 Benchmark for Hall Infrastructure. A Task Force headed by Prof Adebowale was established on the benchmarks and the Task Force is have worked very hard to ensure a comprehensive and continuous upgrade of the facilities in all the Halls of Residence.

3. Career as Chemist

Professor Adebowale is a distinguished chemist of international repute. About one hundred and ten of his publications are listed on Google Scholar and they have been cited more than 6,100 times with an h-index of 40 and i10-index of 78. In SCOPUS, he has been cited 3,735 times with an h-index of 35. Moreover, he has 79 peer-reviewed research articles listed in the Institute for Scientific Information (ISI) database with a total of 2,955 citations. Twenty five of his papers are citation classics having been cited more than 100 times on Google Scholar.

Prof. Adebowale served as a representative of the Physical Sciences group on the Council of the Nigerian Academy of Science, Nigeria's foremost academy of science between 2016 and 2018. He is currently the Treasurer of the Academy. He has been the Chairman, Chemical Society of Nigeria (CSN), Oyo State Chapter, from 2016 to date. Prof. Adebowale has been external examiner to many Universities. Some of these include the Chemistry programmes at

- Modibo Adama University of Technology, Yola
- Olabisi Onabanjo University, Ago - Iwoye
- Bells University of Technology, Otta
- Redeemers University, Mowe
- University of Ilorin,
- Federal University of Agriculture, Abeokuta and
- Department Chemistry and Biochemistry, Bowen University, Iwo.

Beyond the shores of Nigeria, he has served as PhD external examiner to a number of students at the Department of Chemistry, University of Botswana, Gaborone and Vaal University of Technology, Vanderbijlpark, South Africa. He is a reviewer to several International Journals, some of which include:

- Journal of Hazardous Materials
- Chemistry and Ecology
- Food Research International
- Journal of Food Composition and Analysis
- Thermochimica Acta
- Biochemical Engineering
- Carbohydrate Polymers
- Agriculture and Food Chemistry
- Food Chemistry
- International Journal of Biological Macromolecules and Starke.

On the 9th of January, 2020, Professor Kayode Adebowale delivered the 479th Inaugural lecture of the University of Ibadan titled: "Chemistry and the drive towards Sustainability: An Unending Search for Suitable Indigenous Raw Materials".

4. Teaching and Mentorship

In addition to supervising several B.Sc. and M.Sc. projects, Professor Adebowale has successfully supervised to date, 13 PhD students. Currently, he is supervising six other PhD research students. Many of his former research students are now established researchers in their own rights.

In a bid to promote original research in the Chemical Sciences among young scientists in Nigeria, Prof. Adebowale instituted two annual awards, for members of the Nigerian Young Academy; namely the "Prof Kayode Adebowale National Scientist Prize for Women in Chemical Sciences" and the "Prof. Kayode Adebowale National Scientist Prize". To that extent he is both a mentor and a philanthropist.

5. Research Interests and Contributions

Professor Adebowale is an industrial chemist by training. He is widely read, thorough-bred and well published. His research over the years have focused on food chemistry. Some of his most cited papers are highlighted below: Professor Kayode Oyebode Adebowale in collaboration with Bamidele Iromidayo Olu-Owolabi, Esther kehinde Olawumia and Olayide Samuel Lawal studied the functional properties of native, physically and chemically modified breadfruit (Artocarpus artilis) starch. Starch was isolated from breadfruit (Artocarpus artilis). It was further modified by oxidation, acetylation, heat-moisture treatment and annealing. Proximate analysis revealed that following modifications, the annealed (BANS), oxidised (BOS) and acetylated (BACS) starches retained higher moisture content compared to native starch (BNS), while heat-moisture treated starch (BHMTS) had lower moisture content. Crude fibre was reduced by following modifications, except that BNS and BANS had the same value. Protein and fat contents were also reduced after modifications. Acetylation, oxidation and heat-moisture-treatment improved the swelling power of the native starch. The result indicates that all forms of modification reduced the solubility of native breadfruit starch. For all the starches, replacing the wheat flour by the starch resulted in increased alkaline water retention of the blends. Their Gelation studies revealed that native breadfruit starch is a better gelating food material than the modified derivatives. All forms of modification reduced pasting temperature, peak viscosity, hot paste viscosity and cold paste viscosity of the native starch, except that heat-moisture-treatment increased the pasting temperature. Setback value reduced after modifications, indicating that modifications would minimize starch retrogradation.

In collaboration with Adedire, C.O. in 2006, they evaluated the chemical composition and insecticidal activity of Jatropha curcas L. seed using standard techniques. They noted that the Physico-chemical properties of the oil indicated that the acid value, free fatty acids, peroxide value and iodine value were high. The results of their study suggest that J. curcas has antioviposition and ovicidal effects on C. maculatus therefore making it a vaiable candidate for incorporation into pest control program of gain legumes.

He collaborated with Olufunmi O. Olayinkaa and Bamidele I. Olu-Owolabi to study the effect of heat-moisture treatment on physicochemical properties of white sorghum starch. White sorghum starch was subjected to heat-moisture treatment (HMT) at moisture levels ranging from 18% to 27%. It was noted that the treatments had a great impact on the physicochemical properties as studied with a rapid visco analyzer (RVA). The increase in onset temperature of viscosity development and the decrease in the peak viscosity observed with RVA as a consequence of HMTs were also attributed to the decrease in swelling power and solubility. The swelling power and solubility increased with increasing degree of alkalinity which revealed that they were pH dependent with higher values obtained at pH 12 in both native and modified starches. Water absorption capacity, oil absorption capacity and alkaline water retention of the starches were enhanced after HMT.

In another consideration, he partnered with E.I. Unuabonah and B.I. Olu-Owolabi in 2006 to study the Kinetic and thermodynamic of the adsorption of lead (II) ions onto phosphate-modified kaolinite clay. The study focused on the kinetics and thermodynamics of the adsorption of Pb^{2+} onto phosphate-modified and unmodified kaolinite clay obtained from Ubulu-Ukwu in Delta State of Nigeria. Increasing initial Pb^{2+} concentration increased the rate of Pb^{2+} adsorbed with increase in initial Pb^{2+} concentration. Increasing Pb^{2+} concentration also increased the initial adsorption rate for phosphate-modified kaolinite clay and also for unmodified kaolinite clay as Pb^{2+} concentration. Increase in temperature was found to increase the initial sorption rate of Pb^{2+} adsorption onto phosphate-modified adsorbent for the unmodified adsorbent. The overall sorption rate k, increased only slightly for phosphate-modified adsorbent and for unmodified adsorbent. The adsorption reaction on both adsorbents was found to be chemically activated reaction and endothermic with energy of activation, E, at 500 mg/L of Pb^{2+} in solution as 19 and 10.68

kJ mol^{-1} for phosphate-modified and unmodified adsorbents, respectively. The positive values of both and obtained suggest an endothermic reaction and in increase in randomness at the solid-liquid interface during the adsorption of Pb^{2+} onto the adsorbents. values obtained were all negative indicating a spontaneous adsorption process. The presence of Cd^{2+} decreased both initial sorption rate and the amount of Pb^{2+} adsorbed on phosphate-modified and unmodified adsorbents at equilibrium. The adsorption process follows a pseudo-second-order reaction scheme.

In another great and insightful study, Adebowale and his collaborators, Iyayi E. Unuabonah and Bamidele I. Olu-Owolabi in 2006, studied the effect of some operating variables on the adsorption of lead and cadmium ions on kaolinite clay. They noted that the modification of kaolinite clay mineral with orthophosphate (p-modified sample) enhanced adsorption of Pb and Cd ions from aqueous solutions of the metal ions. More so, Increasing pH of solutions of metal ions, increasing adsorbent dose and increasing concentration of metal ion, increased the adsorption of metal ions. Adsorption of both metal ions simultaneously on both unmodified and p-modified samples indicates that adsorption of one metal ion is suppressed to some degree by the other. The presence of electrolyte and their increasing concentration reduced the adsorption capacities of both unmodified and p-modified samples for the metal ions. Ca-electrolytes had more negative effect on the adsorption capacities of the adsorbents than Na-electrolytes. Ca-electrolytes reduced adsorption capacities of the adsorbents for Pb and Cd ions. From Langmuir plots it was observed that these electrolytes increased the binding energy constant of the metal ions unto the adsorbents especially on the p-modified samples. The rate of adsorption of Pb and Cd ions on p-modified adsorbent were increased and equilibrium of metal ion solution were more quickly reached (8 min for Pb ions and 12 min for Cd ions) with p-modified adsorbent as against 20 min for adsorption of both metal ions on unmodified adsorbent when 200 mg/L of metal ion solutions were used during the kinetic studies. When adsorption data were fitted against Langmuir, Freundlich, Toth and Langmuir-Freundlich isotherms, satisfactory fits were found with the Freundlich isotherm. However, at low concentration of metal ions, data also showed satisfactory fits to Langmuir isotherm.

He collaborated with E.I. Unuabonah, B.I. Olu-Owolabi, L.Z. Yang and L.X. Kong in 2008 to carry out a study on the Adsorption of Pb (II) and Cd (II) from aqueous solutions onto sodium tetraborate-modified Kaolinite clay: Equilibrium and thermodynamic studies. Kaolinite clay sample obtained from Ubulu-Ukwu in Delta State of Nigeria was modified with sodium tetraborate to obtain NTB-modified kaolinite clay. X-Ray diffraction (XRD) measurements of NTB-modified kaolinite adsorbent showed no observable change in the d-spacing of its crystal lattice.

Also, the data of XRD confirmed that this kaolinite clay sample is a mixture of kaolinite and Illite clay minerals. The SEM of modified and unmodified samples showed irregular crystal structures. Fourier-transform infrared spectroscopy (FTIR) results proved the surface modification of the kaolinite at -Al-O and -Si-O centers. The NTB-modified adsorbent presented with broader peaks of inner -OH. Modification of kaolinite clay sample with sodium tetraborate decreased its PZC from pH 4.40 to 3.70 while its Specific Surface Area (SSA) was increased.

Modification with sodium tetraborate reagent increased the adsorption capacity of kaolinite clay from 16.16 mg/g to 42.92 mg/g for Pb (II) and 10.75 mg/g to 44.05 mg/g for Cd (II) at 298 K. Increasing temperature was found to increase the adsorption of both metals onto both adsorbents suggesting an endothermic adsorption reaction. The all-inclsive presence of electrolyte in aqueous solution with Pb and Cd (II) was found to decrease the adsorption capacity of NTB-modified adsorbent for Pb and Cd (II). Using the Pearson's Hard and Soft Lewis Acid and Base (HSAB) theory the higher selectivity of unmodified kaolinite clay adsorbent for Pb and NTB-modified kaolinite clay for Cd (II) was justified.

The thermodynamic calculations for the modified kaolinite clay sample indicated an endothermic nature of adsorption for Pb(II) and Cd (II)) and an increase in entropy as a result of adsorption of Pb (II) and Cd (II). The small positive values of free energy change (mean) indicated that the adsorption of Pb (II) and Cd (II) onto the modified adsorbent may require some small amount of energy to make it more feasible. Modeling equilibrium adsorption data obtained suggested that NTB-modified adsorbent sample has homogeneous adsorption sites and fit very well with Langmuir adsorption model.

Regeneration studies suggest that 85% of the metals were desorbed from both adsorbents. On reuse of the adsorbents only 80% of metals were adsorbed. NTB-modified kaolinite clay sample show some very good potentials as a low-cost adsorbent for the adsorption of Pb (II) and Cd (II) from aqueous solutions.

6. Honours, Distinctions and Memberships in Learned Societies

On account of the above outlined academic contributions, Prof. Adebowale has won several significant accolades in his career both home and abroad. Some of these include:

- Fellow, Nigerian Academy of Science
- Fellow, Chemical Society of Nigeria
- Fellow, Polymer Institute of Nigeria
- Fellow, Science Association of Nigeria
- Fellow, Royal Society of Chemistry, Cambridge, United Kingdom

7. Scholarships, Grants and Prizes

He is a Recipient of the International Foundation for Science (IFS) Grant, 2002-2004. He received a Post-Doctoral Research Fellowship from the Alexander von Humboldt Foundation, Germany 1996 to date. He utilised this at the Institute of Organic Chemistry, Ebehards Karls University, Tuebingen and at the Institute for Food Chemistry, Technical University, Dresden. In 2013, he won a continental award, namely the African Union Kwame Nkrumah Continental Scientific Award for Science, Technology and Innovation, with a monetary value of One Hundred Thousand US Dollars (100,000 USD).

8. Position Held

He is a Regular Associate of the Abdus Salam International Centre for Theoretical Physics, ICTP, Trieste, Italy, 2003-2006. He was recently invited by the African Union to serve on the Jury Session of Kwame Nkrumah Awards for Scientific Excellence. He is a member of the Council of Precious Cornerstone University, Ibadan