VIDEO ARTICLE

Vid. Proc. Adv. Mater., Volume 1, Article ID 200822 **(2020)**

Nanotechnology: An Overview of the Current Status of its Roles in the Era of COVID-19

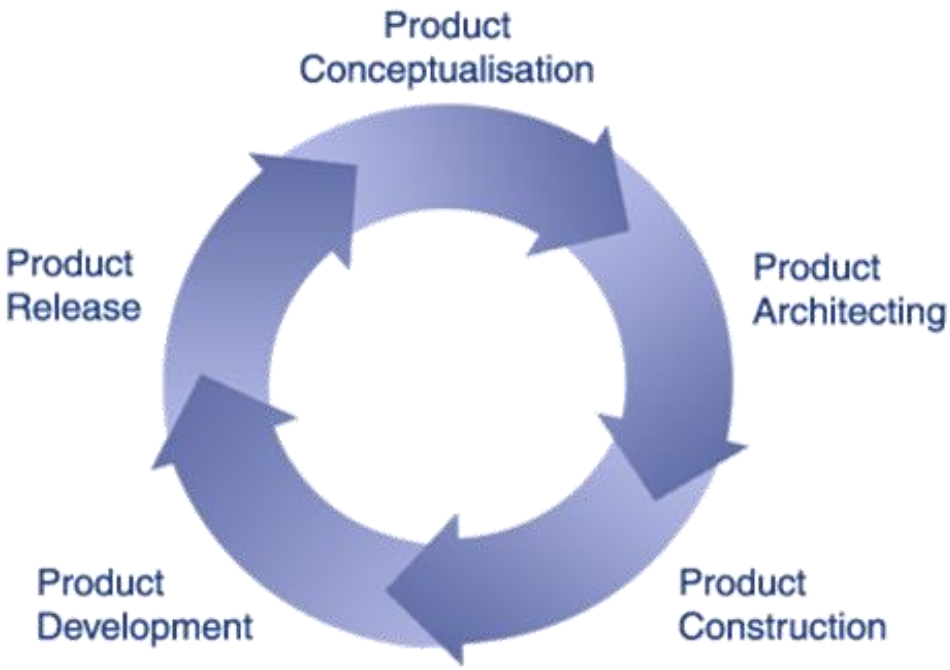
Cajetan M. Akujuobi*

Center of Excellence for Communication Systems Technology Research (CECSTR),
SECURE Cybersecurity Center of Excellence Prairie View A&M University, Prairie View, Texas 77446, USA

*Corresponding and Presenting Author. E-mail: cmakujuobi@pvamu.edu

DOI: 10.5185/vpoam.2020.0822

Graphical Abstract



Abstract

Nanotechnology is about having the capability to organizing, manipulating and measuring matter at the atomic level in scales of one to 100 nanometers (0.1 micrometers (μm)). There are about one billion nanometers (nm) in 1 m [**1**]. Imagine comparing this to the width of a human hair which is approximately 80,000 nm wide [**1**]. Nanotechnology has played significant roles in many areas of society globally [**2,3,4**]. However, while the great applications of nanotechnology and its related products can be exploited, much has not been done in exploring the roles it has played in this era of coronavirus disease 2019 (COVID-19) pandemic, especially, as it relates to the global society. COVID-19 is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that began in December 2019 in Wuhan, China. This talk reviews the current status of the roles nanotechnology is playing in this era of COVID-19, especially as it relates to product conceptualization, architecting, construction, development and release. Viruses such as coronaviruses are the most smart and capable nanoparticles. These viruses have structurally nanoscale features. Viruses are evolutionary works of art and in the fields of gene therapy, vaccinology and immunotherapy, scientists are engineering and using viruses for the smart delivery of molecules and genetic information. However, one cannot just help to ask the question, how can such nanoparticles create so much human loss, havoc and devastation? How can such nanoscale so rapidly metamorphose into a wild beast? COVID-19 has spread globally. As of June 19, 2020, according to John Hopkins University, more than 8,519,543 cases of COVID-19 and 454,582 deaths have been reported globally, of which approximately 2,191,371 of the cases and 118,436 of the deaths are in the United States of America. We hear of outbreaks on daily basis. For example, a particularly large outbreak occurred among the passengers and crew of the Diamond Princess Cruise ship, where more than 700 infections were reported [5]. The question therefore becomes, can nanotechnology and nanomaterials help in the fight against COVID-19? Nanotechnology, however, is making a difference in saving lives. It has played a role in the diagnosing and treatment of COVID-19. It is also being used in the development of drugs against COVID-19 [**2**]. In addition, nanotechnology has helped to bring new opportunities for producing inexpensive and scalable detection methods, safe personal safety equipment and new successful medications [**2**]. The challenge then becomes on how this trajectory can continue of exploiting the great roles nanotechnology can play in moving towards a total eradication of COVID-19, while at the same time making sure all of the safety issues are put in place. This talk explores that and recommendations are suggested as a result of the talk.

Keywords: COVID-19, nanotechnology, nanoparticles, viruses, nanoscale.

Acknowledgements

This research is funded by the TAMU System Chancellor's Research Initiative, Texas Instruments, Sprint, and Northrop Grumman.

References

1. Sheetz T., Vidal J., Pearson T. D., and Lozano K., "Nanotechnology: Awareness and societal Concerns", *Elsevier, Technology in Society*, **2005**, *27*, 329-345.
2. Abdul Waris, Muhammad Ali, Atta Ullah Khan, Asmat Ali, and Abdul, "Role of nanotechnology in diagnosing and treating COVID-19 during the Pandemic", *https://doi.org/10.29328/journal.ijcv.1001017*, retrieved 06 June, **2020**, p.065-070.
3. Sergio Antunes Filho, Otavio Augusto Leitao dos Santos, Mayara Santana, Bianca Pizzorno Backx, "Exploiting Nanotechnology to Target Viruses", *Journal of Nanotechnology Nanomaterials*, **2020**, *1*, 11-15.
4. Akujuobi, C. M. "Nanotechnology Applications in Biomedical Engineering". In Handbook of Research on Diverse Applications of Nanotechnology in Biomedicine, Chemistry, and Engineering, Ed. Shivani Soni, Amandeep Salhotra and Mrutyunjay Suar, 50-63 (**2015**), accessed March 21, **2015**. DOI:10.4018/978-1-4666-6363-3.ch004.
5. Smriti Mallapaty, "What the Cruise-Ship Outbreaks Reveal about COVID-19", *Nature*, April 2, **2020**, *Vol. 580*.

Biography of Presenting Author

Cajetan M. Akujuobi received his O.N.D from the Institute of Management and Technology, Enugu, Nigeria in 1974, the B.S. degree from Southern University, Baton Rouge, Louisiana, in 1980, the M.S. degree from Tuskegee University, Alabama in 1983, Ph.D. degree from George Mason University, Fairfax, Virginia, USA in 1995, all in electrical engineering, and the M.B.A. degree from Hampton University. He is a licensed Professional Engineer (PE) in the State of Texas, USA. He has over 40 years of professional experience working with different corporations and in academia. He is a full Professor in the Department of Electrical & Computer Engineering and was the former Vice President for Research, Innovation and Sponsored Programs at Prairie View A&M University (PVAMU). He also served as the Dean for Graduate Studies at PVAMU for over three years. He is the founding Executive Director of many research programs including the Center of Excellence for Communication Systems Technology Research (CECSTR), a Texas A&M Board of Regents approved center. He is also the Principal Investigator and founder of the SECURE Cybersecurity Center of Excellence. He was the founding Dean of the College of Science, Technology, Engineering and Mathematics at Alabama State University (ASU) from June 12, 2010 - December 31, 2013. At ASU, he founded two new research centers, and was founding Executive Director, Center of Excellence for Communication Systems & Image/Signal/Video Processing (CECSIP) and the founding Executive Director, the STEM Center of Excellence for Modeling & Simulation Research (SCEMSR). He has published extensively including writing books and book Chapters. He has received several honors in research, teaching and service. Two of the books he published with M. N. O. Sadiku, are "Introduction to Broadband Communication Systems", and "Solution Manual for Introduction to Broadband Communication Systems", both published by Chapman & Hall/CRC and Sci-Tech Publication, Boca Raton, Florida, 2008. His new book in Computer Networks with Dr. Sadiku will be published early 2021. His research interests are Cybersecurity, Wavelet Transform Analysis, Communication Systems, Compressive Sensing, Signal/Image/Video Processing., Security

in the Advancement of Nanotechnology, Material Systems (Cyber-Physical Systems), Broadband Communication Systems, Mixed Signal Systems, Smart & Connected Cities and DSP Solutions. Prof. Akujuobi is the Chair of the IEEE Houston Section Life Members Affinity Group (LMAG). He is a Life Senior Member IEEE, Senior Member of Instrument Society of America (ISA), Member of American Society for Engineering Education (ASEE), Sigma XI, the Scientific Research Society, and the Texas Society for Biomedical Research (TSBR) Board of Directors. He was selected as one of the U.S. representatives for engineering educational and consultation mission to Asia in 1989. He is listed in Who's Who in Science and Engineering, Who's Who in the World, Who's Who in America, Who's Who in American Education and Who's Who in Industry & Finance.

Citation of Video Article

Vid. Proc. Adv. Mater., Volume 1, Article ID 200822 **(2020)**

Full Video Article www.proceedings.iaamonline.org/article/ vpoam-2020-0822