Scholars LITERATURE

Nanotechnology and Nanomaterials Research

Mini Review

DOI: https://doi.org/10.47275/2692-885X-107
Volume 1 Issue 2

Nanosensors: An Overview Till 2020

Lopez AP*

Department of Genetics, Molecular Biology Laboratory, Universidad de Buesnos Aires, Argentina

Correspondence to: Ariel Pablo Lopez, Department of Genetics, Molecular Biology Laboratory, Universidad de Buenos Aires, Argentina, E-mail: aplopez@prensamedica.com.ar

Citation: Lopez AP (2020) Nanosensors: An Overview Till 2020. Nanotechnol Nanomater Res, Volume 1:2. 107. DOI: https://doi.org/10.47275/2692-885X-107.

Received: November 16, 2020; **Accepted:** December 16, 2020; **Published:** December 18, 2020

Introduction

Sensors are widely used in our daily lives making it easier and better in every aspect. From home appliances to medical diagnostic systems, they are helpful in everything and anything we can think of. As the technology is advancing, we have started creating a better and more reliable sensors that are hard to see with our naked eye but will have the same functionality as the sensors we have today. So, what are these sensors, what can we call them, how do they define them? Well, they are called nanosensors. The name itself suggests they are sensors that are nanometer in scale, but the nanosensors can be defined as follows.

Definition

Nanosensors are sensors that can be used to detect the presence of chemical species and nanoparticles, or monitor physical parameters such as temperature, on the nanoscale [1].

The basic types of nanosensors available are:

- Physical nanosensors
- Chemical nanosensors
- Optical nanosensors
- Biological nanosensors

All nanosensors are classified into either one of the above based on their mechanisms [2].

Manufacturing Nanosensors

Creating a sensor that is a nanometer in scale is a hard and needs precision in each and every step. There are different methods available in manufacturing a nanosensor and they are [3,4]:

Top-down Method

It begins with a pattern generated at a larger scale, and then reduced to microscale. Some commonly used top-down methods are lithography, fiber pulling, and chemical etching.

Lithography: The process of producing patterns on semiconductor crystals for use as integrated circuits [5]. Electron beam lithography and electrode position are the mainly used lithography methods [3].

Fiber pulling: This method is specially used in optical fiber to develop optical-fiber-based nanosensors [6].

Chemical etching: Turner method and tube etching are types of etching processes which involve etching a fiber to a point while placed in the meniscus [3].

Bottom-up Method

It starts with atoms or molecules that build up to nanostructures. The most commonly known bottom-up methods are chemical synthesis, self-assembly, positional assembly while self-assembly is mainly used for nanosensors [4].

Self-assembly: The complete set of components will automatically assemble into a finished product. This is not a manual process which is cheap and fast [7].

Nanosensors and their Applications

There are many nanosensors that are already in use and are still improving along with the daily activities, the below mentioned are some of the nanosensors and their applications that are mostly used in our day to day life.

Proximity Sensors

Proximity sensors are used for detecting the presence of an object or motion within its range and without any physical contact with the sensor [2]. The proximity sensors are of different variations and are usedin various industrial, mobile, electronic appliances and retail automations. Some applications of proximity sensors are parking sensors in automobiles, ground proximity warning systems, automatic door open systems in malls and complexes, Roller coasters, mobile devices and many more. The proximity nanosensors and their applications are rapidly increasing since they are equally efficient or better than the regular sensors.

Ambient Light Sensors

Ambient light sensors provide precise light detection for a wide range of ambient brightness [2].These sensors are used to control backlight in LCD display mobiles which increases battery life, light sources like natural sunlight, incandescent lamps, and fluorescent. This sensor is also used in automotive applications, backlighting control in DVD players, notebook PCs, digital cameras, electronic signals etc. [8].

Bio-nanosensors

A biosensor is a measurement system for the detection of an analyte that combines a biological component with a physicochemical detector [9]. The applications of a bio-nanosensor include many medical diagnostics, cancer treatment, nanorobots etc.

Chemical Nanosensors

Chemical nanosensors are sensors that detect chemicals by measuring the change in electrical conductivity [10]. These sensors can detect harmful gases in air, analyze micro organisms and toxic chemicals, detection of metal traces, nitrates and such [1]. These sensors are mostly applicable in agricultural, pollution monitoring and many other industrial purposes.

Physical Nanosensors

These sensors detect physical changes such as force, acceleration, mass, volume, density, pressure, temperature and all other physical parameters [2]. These sensors are mostly used in automobiles, weighing machines, electronic devices, and many industrial applications.

Discussion

Nanosensors are already used in each and every field as an upgraded version of the sensors. As they are small in size and are as much efficient as the normal sensors, everyone is interested in working with nanosensors. The manufacturing of nanosensors is also mostly cheap and the process is fast. The nanosensors are classified according to their mechanisms, properties and other quantities like CNT based nanosensors, DNA based nanosensors, Quantum dot based nanosensors, MRI based nanosensors, peptide based nanosensors, Multimodal nanosensors, plasmon coupling based nanosensors, plasmonic enhancing/quenching based nanosensors, and photoacoustic based nanosensors [1]. The mentioned sensors are classified into either four of the nanosensor types but the names are based on the properties of the nanosensors.

Conclusion

In conclusion, it can be said that the nansensors are going to be the future with a better functionality and less costly. With nanosensors and the research in increasing the understanding of the nanotechnology, we are going to advance our technology to greater heights within no time.

References

1. AZO Nano (2007) Nanosensors: Definition, applications and how they work. Manchester, United Kingdom.
2. Alawsi T (2015) Nanosensors basics, design and applications. California, United States.
3. Wikipedia (2020) Nanosensors.
4. Singh BP (2004) Top-down and bottom-up approaches for synthesis of nanomaterials. India.
5. Hartley JG (2009) What is lithography?.New York, United States.
6. Cullum BM, Vo-Dinh T (2000) The development of optical nanosensors for biological measurements. Trends Biotechnol 18: 388-393.https://doi.org/10.1016/S0167-7799(00)01477-3
7. Britannica (2020) Bottom-up approach, Illinois, United States.
8. Ambient light sensor working and applications.
9. Rai M, Gade A, Gaikwad S, Marcato PD, Durán N (2012) Biomedical applications of nanobiosensors: the state-of-the-art. J Braz Chem Soc 23: 14-24.http://dx.doi.org/10.1590/S0103-50532012000100004
10. Critchley T (2018) Nanosensors: An introduction. Manchester, United Kingdom.