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Nanoparticle of ZnO for Drug Delivery

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Abstract

Nanoparticle provide one of the most promising areas of nanotechnology spreading its roots to applications in various fields including medical imaging and diagnosis, drug delivery and even in the treatment of diseases. Various techniques were used to prepare ZnO noparticles, in this research we have used ultrasonic atomization technique to prepare ZnO nanoparticles which is an important for the today's research. These prepared ZnO nanoparticles were characterized by various analytical techniques. The thick film sensor was prepared by this nanoparticles and this sensor is used as one part of nanobots for drug delivery in the field of medical application.

Introduction

Nowadays, nanoparticles are consistently used in field of medicine for various purposes. ZnO nanoparticles are used in various applications of catalyst, photocatalyst, gas sensor and CWA detectors [1-3]. It has a wide band gap semiconductor with a band gap of 3.37 eV. Pure ZnO is n-type semiconductor. Its optical and electrical properties are not very stable at high temperature [4-6]. ZnO nanoparticles have been grown using several deposition techniques, such as: sol-gel [7,8], spray pyrolysis [9] and ultrasonic atomization technique [10]. Applications of nanotechnology in oncology have produced an emerging field of study, nanooncology and with the ease, they offer in design, nanoparticles have revolutionized the drug delivery sector [11,12]. Drug loaded nanoparticles can selectively target tumor cells, thereby keeping our healthy cells safe [13].

Preparation of ZnO nanoparticles

Ultrasonic atomization technique is used for the preparation of ZnO nanoparticles. Aqueous solution of zinc nitrate was prepared in distilled water. When solution was allowed to pass to generator, it was converted into aerosol. The aerosol was pushed forward using compressed air through quartz reactor was placed in double zone tubular furnace with optimum temperature. An aerosol would pass through heating, evaporation, pyrolysis, reaction with air and finally form the fine particles collected in the novel trapping system. The procedure explained elsewhere [14].

Characterizations of ZnO nanoparticles

These powders were characterized various analytical techniques

Preparations of thick film sensor

Furthermore this ZnO nanoparticles is used to prepared thick films sensor which is one of the part of nanoboot using screen-printing techniques. The thixotropic paste was formulated by mixing the ZnO nanoparticles with solution of ethyl cellulose in mixture of organic solvents, such as, butyl cellulose, butyl carbitol acetate and turpineol, etc. The paste was screen printed [15] on glass substrates in the desired pattern to obtain the sensors.

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Sensors

Different types of sensors are used in nanobots like mechanical, thermal, optical, magnetic, chemical and biological sensors. Sensors detect the presence of the target molecules and indirectly know the amount of damage that exists from the change in the functional properties of nanobots. Biosensors use biological reactions to detect target analytes. They are easy to fabricate, can be miniaturised, have good electrical and mechanical resistance and come at a low cost.

Drug delivery

Nanobots having the ability of controlled navigation, deliver drugs to the target or affected areas, hence treating many diseases. They can even penetrate into tissues. These nanobots are usually propelled and/or guided by endogenous or exogenous stimuli towards the area of interest. Wire-shaped magnetoelectric nanobots designed and fabricated can be precisely steered toward a targeted location by means of wireless magnetic fields and can perform on-demand magneto electrically assisted drug release to cells.

Conclusion

ZnO nanoparticles were successfully prepared using ultrasonic atomization technique.The characterizations interpreated that the prepared ZnO particles were nanoparticles in nature. Considering the promising results achieved in the past years in varied fields, ZnO nanoparticles are the promising materials for the drug delivery to the treatment of diseases, addressing the challenges. The wide applications of nanobots promote the development of biomedical technology and human healthcare.

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