Nanoparticles

1- Encapsulated Metal Nanoparticles for Catalysis

By:
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(provided by Clarivate)

CHEMICAL REVIEWS
Volume
121
Issue
2
Page
834-881
DOI
10.1021/acs.chemrev.0c00237
Published
JAN 27 2021
Indexed
2021-03-02
Document Type
Review

Abstract

Metal nanoparticles have drawn great attention in heterogeneous catalysis. One challenge is that they are easily deactivated by migration-coalescence during the catalysis process because of their high surface energy. With the rapid development of nanoscience, encapsulating metal nanoparticles in nanoshells or nanopores becomes one of the most promising strategies to overcome the stability issue of the metal nanoparticles. Besides, the activity and selectivity could be simultaneously enhanced by taking advantage of the synergy between the metal nanoparticles and the encapsulating materials as well as the molecular sieving property of the encapsulating materials. In this review, we provide a comprehensive summary of the recent progress in the synthesis and catalytic properties of the encapsulated metal nanoparticles. This review begins with an introduction to the synthetic strategies for encapsulating metal nanoparticles with different architectures developed to date, including their encapsulation in nanoshells of inorganic oxides and carbon, porous materials (zeolites, metal-organic frameworks, and covalent organic frameworks), and organic capsules (dendrimers and organic cages). The advantages of the encapsulated metal nanoparticles are then discussed, such as enhanced stability and recyclability, improved selectivity, strong metal-support interactions, and the capability of enabling tandem catalysis, followed by the introduction of some representative applications of the encapsulated metal nanoparticles in thermo-, photo-, and electrocatalysis. At the end of this review, we discuss the remaining challenges associated with the encapsulated metal nanoparticles and provide our perspectives on the future development of the field.

Nanoparticles

Keywords
Keywords Plus
COVALENT ORGANIC FRAMEWORKCORE-SHELL NANOPARTICLESONE-POT SYNTHESISULTRAFINE PALLADIUM NANOPARTICLESSPATIALLY SEPARATED COCATALYSTSULTRASMALL GOLD NANOPARTICLESLOW-TEMPERATURE OXIDATIONSILICA-COATED GOLDNOBLE-METALOXYGEN REDUCTION

Nanoparticles

2- Lipid nanoparticles for mRNA delivery

By:
Hou, XC (Hou, Xucheng) [1] ; Zaks, T (Zaks, Tal) [2] ; Langer, R (Langer, Robert) [3] , [4] ; Dong, YZ (Dong, Yizhou) [1]
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(provided by Clarivate)

NATURE REVIEWS MATERIALS
Volume
6
Issue
12
Page
1078-1094
DOI
10.1038/s41578-021-00358-0
Published
DEC 2021
Early Access
AUG 2021
Indexed
2021-08-15
Document Type
Review

Abstract
Messenger RNA (mRNA) has emerged as a new category of therapeutic agent to prevent and treat various diseases. To function in vivo, mRNA requires safe, effective and stable delivery systems that protect the nucleic acid from degradation and that allow cellular uptake and mRNA release. Lipid nanoparticles have successfully entered the clinic for the delivery of mRNA; in particular, lipid nanoparticle-mRNA vaccines are now in clinical use against coronavirus disease 2019 (COVID-19), which marks a milestone for mRNA therapeutics. In this Review, we discuss the design of lipid nanoparticles for mRNA delivery and examine physiological barriers and possible administration routes for lipid nanoparticle-mRNA systems. We then consider key points for the clinical translation of lipid nanoparticle-mRNA formulations, including good manufacturing practice, stability, storage and safety, and highlight preclinical and clinical studies of lipid nanoparticle-mRNA therapeutics for infectious diseases, cancer and genetic disorders. Finally, we give an outlook to future possibilities and remaining challenges for this promising technology.
Lipid nanoparticle-mRNA formulations have entered the clinic as coronavirus disease 2019 (COVID-19) vaccines, marking an important milestone for mRNA therapeutics. This Review discusses lipid nanoparticle design for mRNA delivery, highlighting key points for clinical translation and preclinical studies of lipid nanoparticle-mRNA therapeutics for various diseases.

Nanoparticles

Keywords
Keywords Plus
MEDIATED SIRNA DELIVERYEFFICIENT GENE-TRANSFERIN-VIVOSYSTEMIC DELIVERYCATIONIC LIPIDSIMMUNE-RESPONSESCO-DELIVERYINTRACELLULAR DELIVERYPROTECTIVE EFFICACYANTITUMOR IMMUNITY

Nanoparticles

3- Engineering precision nanoparticles for drug delivery

By:
Mitchell, MJ (Mitchell, Michael J.) [1] , [2] , [3] , [4] , [5] ; Billingsley, MM (Billingsley, Margaret M.) [1] ; Haley, RM (Haley, Rebecca M.) [1] ; Wechsler, ME (Wechsler, Marissa E.) [6] ; Peppas, NA (Peppas, Nicholas A.) [6] , [7] , [8] , [9] , [10] ; Langer, R (Langer, Robert) [11] , [12]
View Web of Science ResearcherID and ORCID
(provided by Clarivate)

NATURE REVIEWS DRUG DISCOVERY
Volume
20
Issue
2
Page
101-124
DOI
10.1038/s41573-020-0090-8
Published
FEB 2021
Early Access
DEC 2020
Indexed
2020-12-29
Document Type
Review

Abstract

In recent years, the development of nanoparticles has expanded into a broad range of clinical applications. Nanoparticles have been developed to overcome the limitations of free therapeutics and navigate biological barriers - systemic, microenvironmental and cellular - that are heterogeneous across patient populations and diseases. Overcoming this patient heterogeneity has also been accomplished through precision therapeutics, in which personalized interventions have enhanced therapeutic efficacy. However, nanoparticle development continues to focus on optimizing delivery platforms with a one-size-fits-all solution. As lipid-based, polymeric and inorganic nanoparticles are engineered in increasingly specified ways, they can begin to be optimized for drug delivery in a more personalized manner, entering the era of precision medicine. In this Review, we discuss advanced nanoparticle designs utilized in both non-personalized and precision applications that could be applied to improve precision therapies. We focus on advances in nanoparticle design that overcome heterogeneous barriers to delivery, arguing that intelligent nanoparticle design can improve efficacy in general delivery applications while enabling tailored designs for precision applications, thereby ultimately improving patient outcome overall.

Nanoparticles

Advances in nanoparticle design could make substantial contributions to personalized and non-personalized medicine. In this Review, Langer, Mitchell, Peppas and colleagues discuss advances in nanoparticle design that overcome heterogeneous barriers to delivery, as well as the challenges in translating these design improvements into personalized medicine approaches.

Keywords
Keywords Plus
ANTIGEN-PRESENTING CELLSMESSENGER-RNA DELIVERYBLOOD-BRAIN-BARRIERPOLYMERIC NANOPARTICLESGENE-THERAPYLIPID NANOPARTICLESTUMOR PENETRATIONIN-VIVOPOLYETHYLENE-GLYCOLRATIONAL DESIGN

Nanoparticles

4- Polymeric Nanoparticles: Production, Characterization, Toxicology and Ecotoxicology

By:
Zielinska, A (Zielinska, Aleksandra) [1] , [2] ; Carreiro, F (Carreiro, Filipa) [1] ; Oliveira, AM (Oliveira, Ana M.) [1] ; Neves, A (Neves, Andreia) [1] ; Pires, B (Pires, Barbara) [1] ; Venkatesh, DN (Venkatesh, D. Nagasamy) [3] ; Durazzo, A (Durazzo, Alessandra) [4] ; Lucarini, M (Lucarini, Massimo) [4] ; Eder, P (Eder, Piotr) [5] ; Silva, AM (Silva, Amelia M.) [6] , [7] ; ...More
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(provided by Clarivate)

MOLECULES
Volume
25
Issue
16
Article Number
3731
DOI
10.3390/molecules25163731
Published
AUG 2020
Indexed
2020-10-30
Document Type
Review

Abstract

Polymeric nanoparticles (NPs) are particles within the size range from 1 to 1000 nm and can be loaded with active compounds entrapped within or surface-adsorbed onto the polymeric core. The term "nanoparticle" stands for both nanocapsules and nanospheres, which are distinguished by the morphological structure. Polymeric NPs have shown great potential for targeted delivery of drugs for the treatment of several diseases. In this review, we discuss the most commonly used methods for the production and characterization of polymeric NPs, the association efficiency of the active compound to the polymeric core, and the in vitro release mechanisms. As the safety of nanoparticles is a high priority, we also discuss the toxicology and ecotoxicology of nanoparticles to humans and to the environment.

Keywords

Author Keywords
polymeric nanoparticlesnanocapsulesnanospherestherapeutic potentialtargeted drug deliverytoxicologyecotoxicology
Keywords Plus

Nanoparticles

IN-VIVO CHARACTERIZATIONDRUG-DELIVERY-SYSTEMSPLGA NANOPARTICLESFORMULATION VARIABLESEX-VIVOVITRONANOCAPSULESNANOSPHERESRELEASESIZE

Nanoparticles

5- Inorganic nanoparticles in clinical trials and translations

By:
Huang, H (Huang, Hui) [1] , [2] ; Feng, W (Feng, Wei) [1] , [2] ; Chen, Y (Chen, Yu) [1] , [2] ; Shi, JL (Shi, Jianlin) [1] , [2]

NANO TODAY
Volume
35
Article Number
100972
DOI
10.1016/j.nantod.2020.100972
Published
DEC 2020
Indexed
2021-01-26
Document Type
Review

Abstract

The development and application of nanotechnology-related knowledge and tools in modern medicine has been showing great potentials in elevating human's living standards and improving mankind's healthcare conditions via the prevention, early detection, diagnosis, treatment and follow-up of various diseases. The significant progress of nanomedicine has been achieved by the exploration of nanoparticulate formulations for theranostic purposes in a living organism. Among abundant nanoparticles, inorganic nanoparticles feature distinctive physiochemical properties and biological effects, with which conventional organic counterparts are typically not endowed. In the past thirty years, to be true, very few inorganic nanomaterials have been made from bench to bedside translation. It is thus more vital than ever for the scientific community to make ever-greater efforts to realize their clinical translations. Therefore, this review highlights and discusses such a compelling topic on the clinical trials and translation of inorganic nanoparticles. We will provide an update of the current progresses in clinic-relevant applications in terms of inorganic nanoparticles being used as detecting tools, contrast agents as well as therapeutic vehicles. Especially, the crucial challenges and future prospects in translating inorganic nanoparticles into clinical practices are highlighted and outlooked. This review aims to bring the issues of clinical relevance and translatability of inorganic nanoparticles to the forefront, which is the primary impetus, and also critically important, for the development of inorganic nanoparticles-based nanobiotechnology and nanomedicine.

Keywords
Author Keywords

Nanoparticles

Inorganic nanoparticlesNanomedicineClinical trialsClinical translation

Keywords Plus

INTRAVENOUS IRON PREPARATIONCANCER-TARGETED PROBESLYMPH-NODE METASTASESHIGH SIGNAL INTENSITYDRUG-DELIVERYQUANTUM DOTSSILICA NANOPARTICLESCONTRAST AGENTSPRUSSIAN-BLUEOXIDE NANOPARTICLES

Nanoparticles

6- Nanoparticles in sustainable agriculture: An emerging opportunity

By:
Singh, RP (Singh, Raghvendra Pratap) [1] ; Handa, R (Handa, Rahul) [2] ; Manchanda, G (Manchanda, Geetanjali) [2]
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(provided by Clarivate)

JOURNAL OF CONTROLLED RELEASE
Volume
329
Page
1234-1248
DOI
10.1016/j.jconrel.2020.10.051
Published
JAN 10 2021
Early Access
FEB 2021
Indexed
2021-04-27
Document Type
Review

Abstract

Conventional agriculture often relies on bulky doses of fertilizers and pesticides that have adversely affected the living beings as well as the ecosystems. As a basic tenet of sustainable agriculture, minimum agrochemicals should be used so that the environment can be protected and various species can be conserved. Further, sustainable agriculture should be a low input system, where the production costs are lower and net returns are higher. The application of nanotechnology in agriculture can significantly enhance the efficiency of agricultural inputs and thus it offers a significant way to maintain sustainable development of agroecosystems via nanoparticles. In this regard, nano-plant growth promoters, nanopesticides, nanofertilizers, nano-herbicides, agrochemical encapsulated nanocarrier systems etc. have been developed for the potential applications in agriculture. These can have great benefits for agriculture, including higher production of crops, inhibition of plant pathogens, removal of unwanted weeds and insects with lesser cost, energy and waste production. However, there are several concerns related to the use of nanoparticles in agriculture. These include the approaches for synthesis, their mechanisms of penetration to applied surfaces and the risks involved. Though, advent of new technologies has significantly improved the synthesis and application of nanomaterials in agriculture, there are many uncertainties regarding nano-synthesis, their way of utilization, uptake and internalization inside the crop cells. Therefore, an elaborate investigation is required for deciphering the engineered nanomaterials, assessing their mechanistic application and agroecological toxicity. Hence, this review is

aimed to critically highlight the NPs material application and points towards the vital gaps in the use of nanotechnology for sustainable agriculture.

Keywords
Author Keywords
MaterialsPlant uptakeNanoformulationNanotoxicitySustainable application

Nanoparticles

7- Enantiomer-dependent immunological response to chiral nanoparticles

By:
Xu, LG (Xu, Liguang) [1] , [2] ; Wang, XX (Wang, Xiuxiu) [1] , [2] ; Wang, WW (Wang, Weiwei) [1] , [2] ; Sun, MZ (Sun, Maozhong) [1] , [2] ; Choi, WJ (Choi, Won Jin) [3] ; Kim, JY (Kim, Ji-Young) [4] ; Hao, CL (Hao, Changlong) [1] , [2] ; Li, S (Li, Si) [5] ; Qu, AH (Qu, Aihua) [1] , [2] ; Lu, MR (Lu, Meiru) [1] , [2] ; ...More
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(provided by Clarivate)

NATURE
Volume
601
Issue
7893
Page
366-+
DOI
10.1038/s41586-021-04243-2
Published
JAN 20 2022
Indexed
2022-02-06
Document Type
Article

Abstract

Chirality is a unifying structural metric of biological and abiological forms of matter. Over the past decade, considerable clarity has been achieved in understanding the chemistry and physics of chiral inorganic nanoparticles(1-4); however, little is known about their effects on complex biochemical networks(5,6). Intermolecular interactions of biological molecules and inorganic nanoparticles show some commonalities(7-9), but these structures differ in scale, in geometry and in the dynamics of chiral shapes, which can both impede and strengthen their mirror-asymmetric complexes. Here we show that achiral and left- and right-handed gold biomimetic nanoparticles show different in vitro and in vivo immune responses. We use irradiation with circularly polarized light (CPL) to synthesize nanoparticles with controllable nanometre-scale chirality and optical anisotropy factors (g-factors) of up to 0.4. We find that binding of nanoparticles to two proteins from the family of adhesion G-protein-coupled receptors (AGPCRs)-namely cluster-of-differentiation 97 (CD97) and epidermal-growth-factor-like-module receptor 1 (EMR1)-results in the opening of mechanosensitive potassium-efflux channels, the production of immune signalling complexes known as inflammasomes, and the maturation of mouse bone-marrow-derived dendritic cells. Both in vivo and in vitro immune responses depend monotonically on the g-factors of the nanoparticles, indicating that nanoscale chirality can be used to regulate the maturation of immune cells. Finally, left-handed nanoparticles show substantially higher (1,258-fold) efficiency compared with

their right-handed counterparts as adjuvants for vaccination against the H9N2 influenza virus, opening a path to the use of nanoscale chirality in immunology.

Keywords
Keywords Plus: SURFACEACTIVATION

8- Green synthesis of nanoparticles using plant extracts: a review

By:
Jadoun, S (Jadoun, Sapana) [1] ; Arif, R (Arif, Rizwan) [1] ; Jangid, NK (Jangid, Nirmala Kumari) [2] ; Meena, RK (Meena, Rajesh Kumar) [3]
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(provided by Clarivate)

ENVIRONMENTAL CHEMISTRY LETTERS
Volume
19
Issue
1
Page
355-374
DOI
10.1007/s10311-020-01074-x
Published
FEB 2021
Early Access
AUG 2020
Indexed
2020-08-27
Document Type
Review

Abstract

Green synthesis of nanoparticles has many potential applications in environmental and biomedical fields. Green synthesis aims in particular at decreasing the usage of toxic chemicals. For instance, the use of biological materials such as plants is usually safe. Plants also contain reducing and capping agents. Here we present the principles of green chemistry, and we review plant-mediated synthesis of nanoparticles and their recent applications. Nanoparticles include gold, silver, copper, palladium, platinum, zinc oxide, and titanium dioxide.

Keywords
Author Keywords
Green synthesisNanoparticlesSustainabilityWaste treatmentDye degradation
Keywords Plus
TITANIUM-DIOXIDE NANOPARTICLESROSEUS LEAF EXTRACTGOLD NANOPARTICLESSILVER NANOPARTICLESZNO NANOPARTICLESPLATINUM NANOPARTICLESAZADIRACHTA-INDICATIO2 NANOPARTICLESMEDIATED SYNTHESISCATALYTIC-ACTIVITY

Nanoparticles

9- Solid Lipid Nanoparticles for Drug Delivery: Pharmacological and Biopharmaceutical Aspects

By:
Montoto, SS (Scioli Montoto, Sebastian) [1] , [2] ; Muraca, G (Muraca, Giuliana) [1] , [3] ; Ruiz, ME (Ruiz, Maria Esperanza) [1] , [2]
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FRONTIERS IN MOLECULAR BIOSCIENCES
Volume
7
Article Number
587997
DOI
10.3389/fmolb.2020.587997
Published
OCT 30 2020
Indexed
2020-11-25
Document Type
Review

Abstract

In the golden age of pharmaceutical nanocarriers, we are witnessing a maturation stage of the original concepts and ideas. There is no doubt that nanoformulations are extremely valuable tools for drug delivery applications; the current challenge is how to optimize them to ensure that they are safe, effective and scalable, so that they can be manufactured at an industrial level and advance to clinical use. In this context, lipid nanoparticles have gained ground, since they are generally regarded as non-toxic, biocompatible and easy-to-produce formulations. Pharmaceutical applications of lipid nanocarriers are a burgeoning field for the transport and delivery of a diversity of therapeutic agents, from biotechnological products to small drug molecules. This review starts with a brief overview of the characteristics of solid lipid nanoparticles and discusses the relevancy of performing systematic preformulation studies. The main applications, as well as the advantages that this type of nanovehicles offers in certain therapeutic scenarios are discussed. Next, pharmacokinetic aspects are described, such as routes of administration, absorption after oral administration, distribution in the organism (including brain penetration) and elimination processes. Safety and toxicity issues are also addressed. Our work presents an original point of view, addressing the biopharmaceutical aspects of these nanovehicles by means of descriptive statistics of the state-of-the-art of solid lipid nanoparticles research. All the presented results, trends, graphs and discussions are based in a systematic (and reproducible) bibliographic search that considered only original papers in the subject, covering a 7 years range (2013-today), a period that accounts for more than 60% of the total number of publications in the topic in the main bibliographic databases and search engines. Focus was placed on the therapeutic fields of application, absorption and distribution processes and

current efforts for the translation into the clinical practice of lipid-based nanoparticles. For this, the currently active clinical trials on lipid nanoparticles were reviewed, with a brief discussion on what achievements or milestones are still to be reached, as a way of understanding the reasons for the scarce number of solid lipid nanoparticles undergoing clinical trials.

Keywords

Author Keywords
clinical trialsdrug deliverynanostructured lipid carriersnanotoxicitypharmacokineticspharmacodynamicsroutes of administrationsolid lipid nanoparticles
Keywords Plus
BLOOD-BRAIN-BARRIERIN-VITROORAL DELIVERYCELLULAR UPTAKEPROTEIN ADSORPTIONTOPICAL DELIVERYGASTROINTESTINAL-TRACTCLASSIFICATION-SYSTEMOLMESARTAN MEDOXOMILPULMONARY DELIVERY

Nanoparticles

10- Multi-shell hollow porous carbon nanoparticles with excellent microwave absorption properties

By:
Tao, JQ (Tao, Jiaqi) [1] , [2] ; Zhou, JT (Zhou, Jintang) [1] , [2] ; Yao, ZJ (Yao, Zhengjun) [1] , [2] ; Jiao, ZB (Jiao, Zibao) [1] , [2] ; Wei, B (Wei, Bo) [1] , [2] ; Tan, RY (Tan, Ruiyang) [1] , [2] ; Li, Z (Li, Zhong) [1] , [2]
View Web of Science ResearcherID and ORCID
(provided by Clarivate)

CARBON
Volume
172
Page
542-555
DOI
10.1016/j.carbon.2020.10.062
Published
FEB 2021
Indexed
2021-01-05
Document Type
Article

Abstract

The micro-morphology design of nanomaterials has always been a hot issue in the field of microwave absorption. In this work, multi-shell structure is made on the basis of hollow structure and porous structure, and the effect of shell number of nanoparticles on microwave absorption properties is studied. Multi-shell hollow porous carbon nanoparticles (HPCNs-m) were prepared by simple liquid phase method combined with layer-by-layer process, and their micro-morphology, chemical structure, electromagnetic properties and microwave absorption properties were studied by a variety of characterization methods. The results show that the multi-shell structure is beneficial to improve the conductivity loss and polarization loss, so as to enhance the microwave absorption properties of the samples. In all samples, the effective absorption bandwidth (EAB) of three-shell hollow porous carbon nanoparticles (HPCNs-3) is 5.17 GHz under the thickness of 1.6 mm, and the best reflection loss (RL) is -18.13 dB at 14.66 GHz. This work expands the study of the effect of the number of shells on microwave absorption properties, and provides a useful reference for the design of microwave absorbers. (C) 2020 Elsevier Ltd. All rights reserved.

Keywords
Author Keywords
HollowPorousMulti-shellLayer-by-LayerMicrowave absorption
Keywords Plus

Nanoparticles

ELECTROMAGNETIC-WAVE ABSORPTIONFACILE SYNTHESISSHELL THICKNESSCOMPOSITESGRAPHENEMICROSPHERESSPHERESPARTICLESABSORBERNANOCOMPOSITES

11- Antimicrobial nanoparticles and biodegradable polymer composites for active food packaging applications

By:
Omerovic, N (Omerovic, Nejra) [1] ; Djisalov, M (Djisalov, Mila) [1] ; Zivojevic, K (Zivojevic, Kristina) [1] ; Mladenovic, M (Mladenovic, Minja) [1] ; Vunduk, J (Vunduk, Jovana) [2] , [3] ; Milenkovic, I (Milenkovic, Ivanka) [2] ; Knezevic, NZ (Knezevic, Nikola Z.) [1] ; Gadjanski, I (Gadjanski, Ivana) [1] ; Vidic, J (Vidic, Jasmina) [4]
View Web of Science ResearcherID and ORCID
(provided by Clarivate)

Volume
20
Issue
3
Page
2428-2454
DOI
10.1111/1541-4337.12727
Published
MAY 2021
Early Access
MAR 2021
Indexed
2021-03-25
Document Type
Review

Abstract

The food industry faces numerous challenges to assure provision of tasty and convenient food that possesses extended shelf life and shows long-term high-quality preservation. Research and development of antimicrobial materials for food applications have provided active antibacterial packaging technologies that are able to meet these challenges. Furthermore, consumers expect and demand sustainable packaging materials that would reduce environmental problems associated with plastic waste. In this review, we discuss antimicrobial composite materials for active food packaging applications that combine highly efficient antibacterial nanoparticles (i.e., metal, metal oxide, mesoporous silica and graphene-based nanomaterials) with biodegradable and environmentally friendly green polymers (i.e., gelatin, alginate, cellulose, and chitosan) obtained from plants, bacteria, and animals. In addition, innovative syntheses and processing techniques used to obtain active and safe packaging are showcased. Implementation of such green active packaging can significantly reduce the risk of foodborne pathogen outbreaks, improve food safety and quality, and minimize product losses, while reducing waste and maintaining sustainability.

Nanoparticles

Keywords
Author Keywords
food safetyfoodborne pathogensnanocompositesnanofillersshelf life

Nanoparticles

12- Pseudomonas indica-Mediated Silver Nanoparticles: Antifungal and Antioxidant Biogenic Tool for Suppressing Mucormycosis Fungi

By:
Salem, SS (Salem, Salem S.) [1] ; Ali, OM (Ali, Omar M.) [2] ; Reyad, AM (Reyad, Ahmed M.) [3] , [4] ; Abd-Elsalam, KA (Abd-Elsalam, Kamel A.) [5] ; Hashem, AH (Hashem, Amr H.) [1]
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(provided by Clarivate)

JOURNAL OF FUNGI
Volume
8
Issue
2
Article Number
126
DOI
10.3390/jof8020126
Published
FEB 2022
Indexed
2022-03-17
Document Type
Article

Jump to
Enriched Cited References

Abstract

Mucormycosis is considered one of the most dangerous invasive fungal diseases. In this study, a facile, green and eco-friendly method was used to biosynthesize silver nanoparticles (AgNPs) using Pseudomonas indica S. Azhar, to combat fungi causing mucormycosis. The biosynthesis of AgNPs was validated by a progressive shift in the color of P. indica filtrate from colorless to brown, as well as the identification of a distinctive absorption peak at 420 nm using UV-vis spectroscopy. Fourier-transform infrared spectroscopy (FTIR) results indicated the existence of bioactive chemicals that are responsible for AgNP production. AgNPs with particle sizes ranging from 2.4 to 53.5 nm were discovered using transmission electron microscopy (TEM). Pattern peaks corresponding to the 111, 200, 220, 311, and 222 planes, which corresponded to face-centered cubic forms of metallic silver, were also discovered using X-ray diffraction (XRD). Moreover, antifungal activity measurements of biosynthesized AgNPs against Rhizopus Microsporus, Mucor racemosus, and Syncephalastrum racemosum were carried out. Results of antifungal activity analysis revealed that the biosynthesized AgNPs exhibited outstanding antifungal activity against all tested fungi at a concentration of 400 mu g/mL, where minimum inhibitory concentrations (MIC) were 50, 50, and 100 mu g/mL toward R. microsporus, S. racemosum, and M.

racemosus respectively. In addition, the biosynthesized AgNPs revealed antioxidant activity, where IC50 was 31 mu g/mL when compared to ascorbic acid (0.79 mu g/mL). Furthermore, the biosynthesized AgNPs showed no cytotoxicity on the Vero normal cell line. In conclusion, the biosynthesized AgNPs in this study can be used as effective antifungals with safe use, particularly for fungi causing mucormycosis.

Keywords
Author Keywords
silver nanoparticlesgreen biosynthesisantifungal activitymucormycosisantioxidant activity
Keywords Plus
BIOMEDICAL APPLICATIONSBACILLUS-SUBTILISBIOSYNTHESISRESISTANCECYTOTOXICITYEPIDEMIOLOGYMECHANISMS

Nanoparticles

13- Heterogeneous UV-Switchable Au nanoparticles decorated tungstophosphoric acid/TiO2 for efficient photocatalytic degradation process

By:
Orooji, Y (Orooji, Yasin) [1] , [2] ; Tanhaei, B (Tanhaei, Bahareh) [3] ; Ayati, A (Ayati, Ali) [3] ; Tabrizi, SH (Tabrizi, Soheil Hamidi) [3] ; Alizadeh, M (Alizadeh, Marzieh) [4] ; Bamoharram, FF (Bamoharram, Fatemeh F.) [5] ; Karimi, F (Karimi, Fatemeh) [3] ; Salmanpour, S (Salmanpour, Sadegh) [6] ; Rouhi, J (Rouhi, Jalal) [7] ; Afshar, S (Afshar, Safoora) [3] ; ...More
View Web of Science ResearcherID and ORCID
(provided by Clarivate)

CHEMOSPHERE
Volume
281
Article Number
130795
DOI
10.1016/j.chemosphere.2021.130795
Published
OCT 2021
Early Access
MAY 2021
Indexed
2021-07-17
Document Type
Article

Abstract

In the present study, gold nanoparticles were locally well-decorated on the surface of TiO2 using the tungstophosphoric acid (HPW), as UV-switchable reducing intermediate linkers. The prepared Au NPs/HPW/TiO2 nanostructure was characterized using FTIR, XRD, EDS, SEM and TEM, which confirmed the successful attachment of quasi-spherical Au NPs in the range of 20-30 nm on the surface of HPW modified TiO2. Also, the FTIR results show that the Au NPs were binded to TiO2 through the terminal the oxygen atoms HPW. The photocatalytic performance of prepared nanostructures was assessed in degradation of nitrobenzene. The nitrobenzene photodegradation kinetic study revealed that it well followed the Langmuir-Hinshelwood kinetic model with the apparent rate constant of 0.001 min(-1) using anatase TiO2, 0.0004 min(-1) using HPW, 0.0014 using HPW/TiO2, while it was obtained 0.0065 min(-1) using Au NPs@HPW/TiO2 nanostructure. It shows that the photocatalytic rate of the prepared nanocomposites increased by 6.5- and 4.6-fold compared to photoactivity of anatase TiO2 and HPW/TiO2 respectively. Also, the photocatalytic mechanism of process was proposed. Moreover, the reusability study confirmed that its photocatalytic activity still remained high after three cycles.

Nanoparticles

Keywords
Author Keywords
TiO2PolyoxometalateGold nanoparticleNitrobenzenePhotodegradation
Keywords Plus
METAL NANOPARTICLESGOLD NANOPARTICLESDOPED
TIO2REMOVALPOLYOXOMETALATENANOCOMPOSITENITROBENZENEWATERPERFORMANCEELECTRODE

Nanoparticles

14- Effect of Particle Size and Surface Charge on Nanoparticles Diffusion in the Brain White Matter

By:
Yuan, T (Yuan, Tian) [1] ; Gao, L (Gao, Ling) [2] ; Zhan, WB (Zhan, Wenbo) [3] ; Dini, D (Dini, Daniele) [1]
View Web of Science ResearcherID and ORCID
(provided by Clarivate)

PHARMACEUTICAL RESEARCH
Volume
39
Issue
4
Page
767-781
DOI
10.1007/s11095-022-03222-0
Published
APR 2022
Early Access
MAR 2022
Indexed
2022-03-31
Document Type
Article
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Enriched Cited References

Abstract

Purpose Brain disorders have become a serious problem for healthcare worldwide. Nanoparticle-based drugs are one of the emerging therapies and have shown great promise to treat brain diseases. Modifications on particle size and surface charge are two efficient ways to increase the transport efficiency of nanoparticles through brain-blood barrier; however, partly due to the high complexity of brain microstructure and limited visibility of Nanoparticles (NPs), our understanding of how these two modifications can affect the transport of NPs in the brain is insufficient. Methods In this study, a framework, which contains a stochastic geometric model of brain white matter (WM) and a mathematical particle tracing model, was developed to investigate the relationship between particle size/surface charge of the NPs and their effective diffusion coefficients (D) in WM. Results The predictive capabilities of this method have been validated using published experimental tests. For negatively charged NPs, both particle size and surface charge are positively correlated with D before reaching a size threshold. When Zeta potential (Zp) is less negative than -10 mV, the difference between NPs' D in WM and pure interstitial fluid (IF) is limited. Conclusion A deeper understanding on the relationships between particle size/surface charge of NPs and their D in WM has been obtained. The results from this study and the developed

modelling framework provide important tools for the development of nano-drugs and nano-carriers to cure brain diseases.

Keywords
Author Keywords
Brain diseasesBrain tissueDiffusion coefficientExtracellular spaceNanoparticles
Keywords Plus
DRUG-DELIVERYEXTRACELLULAR-SPACESOLUTE TRANSPORTCELLULAR UPTAKEMIXTURE THEORYMODELSTABILITYBARRIERFLUIDMICROVASCULATURE

Nanoparticles

15- Foliar Application of Zinc Oxide Nanoparticles Promotes Drought Stress Tolerance in Eggplant (Solanum melongena L.)

By:
Semida, WM (Semida, Wael M.) [1] ; Abdelkhalik, A (Abdelkhalik, Abdelsattar) [1] ; Mohamed, GF (Mohamed, Gamal F.) [2] ; Abd El-Mageed, TA (Abd El-Mageed, Taia A.) [3] ; Abd El-Mageed, SA (Abd El-Mageed, Shimaa A.) [4] ; Rady, MM (Rady, Mostafa M.) [2] ; Ali, EF (Ali, Esmat F.) [5]
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(provided by Clarivate)

PLANTS-BASEL
Volume
10
Issue
2
Article Number
421
DOI
10.3390/plants10020421
Published
FEB 2021
Indexed
2021-03-19
Document Type
Article
Jump to
Enriched Cited References

Abstract

Water shortage and salinity are major challenges for sustaining global food security. Using nutrients in the nano-scale formulation including zinc oxide nanoparticles (ZnO NP) is a novel fertilization strategy for crops. In this study, two field-based trials were conducted during 2018 and 2019 to examine the influence of three ZnO NP concentrations (0, 50, and 100 ppm) in eggplant grown under full irrigation (100 of crop evapotranspiration; ETc) and drought stress (60% of ETc). Plant growth, yield, water productivity (WP), physiology, biochemistry, and anatomy responses were evaluated. Drought stress significantly decreased membrane stability index (MSI), relative water content (RWC), and photosynthetic efficiency, thus hampered eggplant growth and yield. In contrast, exogenous ZnO NP to water-stressed eggplant resulted in increased RWC and MSI associated with improved stem and leaf anatomical structures and enhanced photosynthetic efficiency. Under drought stress, supplementation of 50 and 100 ppm ZnO NP improved growth characteristics and increased fruit yield by 12.2% and 22.6%, respectively, compared with fully irrigated plants and nonapplied ZnO NP. The highest water productivity (WP) was obtained when eggplant was irrigated with 60% ETc and foliarly treated with 50 or 100 ppm of ZnO NP, which led to 50.8-66.1%

increases in WP when compared with nontreated fully irrigated plants. Collectively, these findings demonstrated that foliar spraying ZnO NP gives the utility for alleviating drought stress effects on eggplant cultivated in saline soil.

Keywords
Author Keywords
zinc oxide nanoparticlesdeficit irrigationwater productivityphotosynthetic efficiencygrowth and productivity

16- Lipid Nanoparticles-From Liposomes to mRNA Vaccine Delivery, a Landscape of Research Diversity and Advancement

By:
Tenchov, R (Tenchov, Rumiana) [1] ; Bird, R (Bird, Robert) [1] ; Curtze, AE (Curtze, Allison E.) [1] ; Zhou, QQ (Zhou, Qiongqiong) [1]
View Web of Science ResearcherID and ORCID
(provided by Clarivate)

ACS NANO
Volume
15
Issue
11
Page
16982-17015
DOI
10.1021/acsnano.1c04996
Published
NOV 23 2021
Indexed
2022-02-17
Document Type
Review

Abstract

Lipid nanoparticles (LNPs) have emerged across the pharmaceutical industry as promising vehicles to deliver a variety of therapeutics. Currently in the spotlight as vital components of the COVID-19 mRNA vaccines, LNPs play a key role in effectively protecting and transporting mRNA to cells. Liposomes, an early version of LNPs, are a versatile nanomedicine delivery platform. A number of liposomal drugs have been approved and applied to medical practice. Subsequent generations of lipid nanocarriers, such as solid lipid nanoparticles, nanostructured lipid carriers, and cationic lipid-nucleic acid complexes, exhibit more complex architectures and enhanced physical stabilities. With their ability to encapsulate and deliver therapeutics to specific locations within the body and to release their contents at a desired time, LNPs provide a valuable platform for treatment of a variety of diseases. Here, we present a landscape of LNP-related scientific publications, including patents and journal articles, based on analysis of the CAS Content Collection, the largest human-curated collection of published scientific knowledge. Rising trends are identified, such as nanostructured lipid carriers and solid lipid nanoparticles becoming the preferred platforms for numerous formulations. Recent advancements in LNP formulations as drug delivery platforms, such as antitumor and nucleic acid therapeutics and vaccine delivery systems, are discussed.

Challenges and growth opportunities are also evaluated in other areas, such as medical imaging, cosmetics, nutrition, and agrochemicals. This report is intended to serve as a useful resource for those interested in LNP nanotechnologies, their applications, and the global research effort for their development.

Keywords
Author Keywords
lipid nanoparticleliposomecationic lipidsolid lipid nanoparticlenanostructured lipid carrierimmunoliposome"stealth" liposomedrug delivery
Keywords Plus
TEMPERATURE-SENSITIVE LIPOSOMESTIMULI-RESPONSIVE NANOCARRIERSCONTROLLED DRUG-DELIVERYPHASE-II TRIALGENE-TRANSFERFOLATE RECEPTORAMPHOTERICIN-BTHERAPEUTIC-EFFICACYCLINICAL TRANSLATIONMONOCLONAL-ANTIBODY

17- Gold nanoparticles-modified MnFe2O4 with synergistic catalysis for photo-Fenton degradation of tetracycline under neutral pH

By:
Qin, L (Qin, Lei) [1] , [2] ; Wang, ZH (Wang, Zhihong) [1] , [2] ; Fu, YK (Fu, Yukui) [1] , [2] ; Lai, C (Lai, Cui) [1] , [2] ; Liu, XG (Liu, Xigui) [1] , [2] ; Li, BS (Li, Bisheng) [1] , [2] ; Liu, SY (Liu, Shiyu) [1] , [2] ; Yi, H (Yi, Huan) [1] , [2] ; Li, L (Li, Ling) [1] , [2] ; Zhang, MM (Zhang, Mingming) [1] , [2] ; ...More

JOURNAL OF HAZARDOUS MATERIALS
Volume
414
Article Number
125448
DOI
10.1016/j.jhazmat.2021.125448
Published
JUL 15 2021
Early Access
FEB 2021
Indexed
2021-06-10
Document Type
Article

Abstract

To decrease the adverse environmental and health-related effects of antibiotics, a series of MnFe2O4-Au (MFO-Au) composites were prepared by simple co-precipitation and photoreduction methods for efficient photo-Fenton degradation of tetracycline (TC). The synergistic effect of MFO and gold nanoparticles (AuNPs) with high absorption of visible light and strong photogenerated carrier separation efficiency endowed MFO-Au-3 an outstanding photo-Fenton catalytic performance for TC degradation in neutral condition. The surface hydroxyl of MFO profited to generation of center dot OH, and negative charged or partially polarized AuNPs benefited to adsorption of H2O2, which had a synergistic effect on enhancing the photo-Fenton catalytic performance of MFO-Au. 88.3% of TC was efficiently removed and about 51.9% of TOC decreased within 90 min. The electron spin resonance and quenching tests suggested that h(+) and e(-) were responsible for the high catalytic degradation and center dot OH and O-2(-) participated in the photo-Fenton reaction. The toxicity assessment by seed germination experiments showed efficient toxicity reduction of this system. Besides, MFO-Au exhibited high stability, good cycle, relatively economical and practical application performance, which is expected to provide potential guidance for the design and combination of noble nanoparticles with high stability and spinel bimetallic oxides with high catalytic activity in photo-Fenton reactions.

Nanoparticles

Keywords
Author Keywords
Antibiotics degradationPhoto-FentonMnFe2O4AuNPsToxicity assessment
Keywords Plus
PHOTOCATALYTIC ACTIVITYDIAMOND NANOPARTICLESFACILE SYNTHESISREMOVALMECHANISMANTIBIOTICSPERFORMANCEFABRICATIONACTIVATIONOXIDATION

18- Green synthesis of Cu-doped ZnO nanoparticles and its application for the photocatalytic degradation of hazardous organic pollutants

By:
Karthik, KV (Karthik, K., V) [1] ; Raghu, AV (Raghu, A., V) [2] ; Reddy, KR (Reddy, Kakarla Raghava) [3] ; Ravishankar, R (Ravishankar, R.) [1] ; Sangeeta, M (Sangeeta, M.) [1] ; Shetti, NP (Shetti, Nagaraj P.) [4] ; Reddy, CV (Reddy, Ch Venkata) [5]
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(provided by Clarivate)

CHEMOSPHERE
Volume
287
Part
2
Article Number
132081
DOI
10.1016/j.chemosphere.2021.132081
Published
JAN 2022
Early Access
SEP 2021
Indexed
2021-10-20
Document Type
Article
Jump to
Enriched Cited References

Abstract

In recent times, the synthesis of metal nanoparticles (NPs) using plant extracts has recently emerged as an intriguing issue in the field of nanoscience and nanobiotechnology, with numerous advantages over conventional physicochemical approaches. In the current study, ZnO NPs were synthesized from Synadium grantii leaf extricate with varying Cu-dopant concentrations. In order to the synthesis of the pure and Cu-doped ZnO NPs, zinc nitrate hexahydrate and copper nitrate trihydrate were used as a precursor in leaf extracts of the plant. XRD, TEM, FTIR, XPS, and PL measurements were carried out to examine the physical and optical properties of the synthesized samples. The photocatalytic studies of the prepared samples were studied using Methylene blue (MB), Indigo Carmine (IC), and Rhodamine B (RhB) organic pollutants. The wurtzite crystal structure of synthesized samples was confirmed by XRD and TEM analysis. Further, the presence of functional groups in the prepared samples was confirmed by FTIR

analysis. XPS analysis confirmed that the binding energies of a host material and dopant ions. The emission peaks identified at 424, 446 and 573 nm are associated with the electron movement from the deep donor level, zinc interstitial to the zinc vacancy and oxygen vacancy. 3% and 5% Cudoped samples exhibited superior photocatalytic activity for MB, IC, and RhB dyes. The green synthesized ZnO NPs showed enriched photocatalytic performance, signifying that bio-synthesis can be an outstanding approach to develop versatile and environmental products.

Keywords
Author Keywords
Green synthesisDoped ZnO nanoparticlesMorphologyPhotocatalysisToxic organic pollutantsEnvironmental remediation
Keywords Plus
EMISSIONBEHAVIORDYE

Nanoparticles

19- Bio-inspired peristaltic propulsion of hybrid nanofluid flow with Tantalum (Ta) and Gold (Au) nanoparticles under magnetic effects

By:
Bhatti, MM (Bhatti, M. M.) [1] ; Abdelsalam, SI (Abdelsalam, Sara, I) [2] , [3]
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(provided by Clarivate)

WAVES IN RANDOM AND COMPLEX MEDIA
DOI
10.1080/17455030.2021.1998728
Early Access
NOV 2021
Indexed
2021-11-17
Document Type
Article; Early Access
Jump to
Enriched Cited References

Abstract

The current study looks at the peristaltically driven motion of Carreau fluid in a symmetric channel under the influence of an induced and applied magnetic field. Tantalum (Ta) and Gold (Au) nanoparticles (NPs) with thermal radiation effects are incorporated in the hybrid nanofluid. The proposed mathematical modeling in two dimensions is finalized by employing lubrication theory. The finalized forms of mathematical modeling are nonlinear, and a perturbation approach is used to solve them. Up to the second-order approximation, solutions for velocity distribution, induction equation, and temperature distribution are reported. For velocity, current density, magnetic force function, induced magnetic field, and temperature profile, graphical and numerical results are presented. For simple and hybrid nanofluids, shear-thinning, Newtonian, and shear-thickening scenarios, numerical data are also presented. The current study aims to be useful in the medical field since Ta-NPs with low cytotoxicity can remove unwanted reactive oxygen species, providing protection for biomedical applications. Magnetic drug targeting is an effective and accurate way for drug delivery to the affected areas in biomedical science. It is accomplished by binding the medicine to biologically suitable magnetic nanoparticles, which are then steered towards the target by carefully placing magnets on the body's external surface.

Keywords
Author Keywords
Hybrid nanofluidTantalum (Ta)Gold (Au)magnetic fieldperistaltic motionperturbation approach
Keywords Plus
COUPLE STRESS FLUIDBLOOD-FLOWBIOLOGICAL PERFORMANCEARTERYSUSPENSIONFIELDIMPACT

Nanoparticles

20- Sensitive and Selective Electrochemical Detection of Epirubicin as Anticancer Drug Based on Nickel Ferrite Decorated with Gold Nanoparticles

By:
Mehmandoust, M (Mehmandoust, Mohammad) [1] , [2] ; Erk, N (Erk, Nevin) [1] , [2] ; Karaman, C (Karaman, Ceren) [3] ; Karimi, F (Karimi, Fatemeh) [4] ; Salmanpour, S (Salmanpour, Sadegh) [5]
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MICROMACHINES
Volume
12
Issue
11
Article Number
1334
DOI
10.3390/mi12111334
Published
NOV 2021
Indexed
2021-12-15
Document Type
Article
Jump to
Enriched Cited References

Abstract

The accurate and precise monitoring of epirubicin (EPR), one of the most widely used anticancer drugs, is significant for human and environmental health. In this context, we developed a highly sensitive electrochemical electrode for EPR detection based on nickel ferrite decorated with gold nanoparticles (Au@NiFe2O4) on the screen-printed electrode (SPE). Various spectral characteristic methods such as Fourier transform infrared spectra (FT-IR), X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM), ultraviolet-visible spectroscopy (UV-Vis), energy-dispersive X-ray spectroscopy (EDX) and electrochemical impedance spectroscopy (EIS) were used to investigate the surface morphology and structure of the synthesized Au@NiFe2O4 nanocomposite. The novel decorated electrode exhibited a high electrocatalytic activity toward the electrooxidation of EPR, and a nanomolar limit of detection (5.3 nM) was estimated using differential pulse voltammetry (DPV) with linear concentration ranges from 0.01 to 0.7 and 0.7 to 3.6 mu M. The stability, selectivity, repeatability reproducibility and reusability, with a very low electrode response detection limit, make it very appropriate for determining trace amounts of EPR in pharmaceutical and clinical preparations.

Nanoparticles

Keywords
Author Keywords
epirubicinanticancermonitoringnickel ferritegold nanoparticles
Keywords Plus
GLASSY-CARBON ELECTRODEPASTE ELECTRODEVOLTAMMETRIC SENSORMETHOTREXATEDOXORUBICINPLASMAACIDCHEMOTHERAPYVINBLASTINEMETABOLITES

21- Selective Naked-Eye Detection of SARS-CoV-2 Mediated by N Gene Targeted Antisense Oligonucleotide Capped Plasmonic Nanoparticles

By:
Moitra, P (Moitra, Parikshit) [1] , [2] ; Alafeef, M (Alafeef, Maha) [1] , [2] , [3] ; Dighe, K (Dighe, Ketan) [4] ; Frieman, MB (Frieman, Matthew B.) [5] ; Pan, D (Pan, Dipanjan) [1] , [2] , [3] , [4]
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ACS NANO
Volume
14
Issue
6
Page
7617-7627
DOI
10.1021/acsnano.0c03822
Published
JUN 23 2020
Indexed
2020-07-14
Document Type
Article

Abstract

The current outbreak of the pandemic coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) demands its rapid, convenient, and large-scale diagnosis to downregulate its spread within as well as across the communities. But the reliability, reproducibility, and selectivity of majority of such diagnostic tests fail when they are tested either to a viral load at its early representation or to a viral gene mutated during its current spread. In this regard, a selective "naked-eye" detection of SARS-CoV-2 is highly desirable, which can be tested without accessing any advanced instrumental techniques. We herein report the development of a colorimetric assay based on gold nanoparticles (AuNPs), when capped with suitably designed thiol-modified antisense oligonucleotides (ASOs) specific for N-gene (nucleocapsid phosphoprotein) of SARS-CoV-2, could be used for diagnosing positive COVID-19 cases within 10 min from the isolated RNA samples. The thiol-modified ASO-capped AuNPs agglomerate selectively in the presence of its target RNA sequence of SARS-CoV-2 and demonstrate a change in its surface plasmon resonance. Further, the addition of RNaseH cleaves the RNA strand from the RNA-DNA hybrid leading to a visually detectable precipitate from the solution mediated by the additional agglomeration among the AuNPs. The selectivity of the assay has been monitored in the presence of MERS-CoV viral RNA with a limit of detection of 0.18 ng/mu L of RNA having SARS-CoV-2 viral

load. Thus, the current study reports a selective and visual "nakedeye" detection of COVID-19 causative virus, SARS-CoV-2, without the requirement of any sophisticated instrumental techniques.

Keywords
Author Keywords
gold nanoparticlenaked-eye detectionCOVID-19antisense oligonucleotidehyperspectral imagingSARS-CoV-2
Keywords Plus
COLORIMETRIC DETECTIONGOLD NANOPARTICLESRATIONAL DESIGNCOVID-19DNACORONAVIRUSSEQUENCESASSAY

Nanoparticles

22- Rapid and Sensitive Detection of anti-SARS-CoV-2 IgG, Using Lanthanide-Doped Nanoparticles-Based Lateral Flow Immunoassay

By:
Chen, ZH (Chen, Zhenhua) [2] ; Zhang, ZG (Zhang, Zhigao) [2] ; Zhai, XM (Zhai, Xiangming) [2] ; Li, YY (Li, Yongyin) [4] ; Lin, L (Lin, Li) [2] ; Zhao, H (Zhao, Hui) [5] ; Bian, L (Bian, Lun) [2] ; Li, P (Li, Peng) [2] ; Yu, L (Yu, Lei) [3] ; Wu, YS (Wu, Yingsong) [2] ; ...More
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ANALYTICAL CHEMISTRY
Volume
92
Issue
10
Page
7226-7231
DOI
10.1021/acs.analchem.0c00784
Published
MAY 19 2020
Indexed
2020-06-16
Document Type
Article

Abstract

The outbreak of 2019 coronavirus disease (COVID-19) has been a challenge for hospital laboratories because of the huge number of samples that must be tested for the presence of the causative pathogen, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Simple and rapid immunodiagnostic methods are urgently needed to identify positive cases. Here we report the development of a rapid and sensitive lateral flow immunoassay (LFIA) that uses lanthanide-doped polysterene nanoparticles LNPs) to detect anti-SARV-CoV-2 IgG in human serum. A recombinant nucleocapsid phosphoprotein of SARS-CoV-2 was dispensed onto a nitrocellulose membrane to capture specific IgG. Mouse anti-human IgG antibody was labeled with self-assembled LNPs that served as a fluorescent reporter. A 100-mu L aliquot of serum samples (1:1000 dilution) was used for this assay and the whole detection process took 10 min. The results of the validation experiment met the requirements for clinical diagnostic reagents. A value of 0.0666 was defined as the cutoff value by assaying 51 normal samples. We tested 7 samples that were positive by reverse-transcription (RT-)PCR and 12 that were negative but clinically suspicious for the presence of anti-SARS-CoV-2 IgG. One of the negative samples was determined to be SARS-CoV-2 IgG positive, while the results for the other samples were consistent with those obtained by RT-PCR. Thus, this assay can achieve rapid and sensitive detection of anti-SARS-CoV-2 IgG in human serum and allow positive identification in

suspicious cases; it can also be useful for monitoring the progression COVID-19 and evaluating patients' response to treatment.

Keywords
Keywords Plus: CORONAVIRUSASSAY

23- Preparation and characterization of zein/carboxymethyl dextrin nanoparticles to encapsulate curcumin: Physicochemical stability, antioxidant activity and controlled release properties

By:
Meng, R (Meng, Ran) [1] , [4] ; Wu, ZZ (Wu, Zhengzong) [3] ; Xie, QT (Xie, Qiu-Tao) [2] ; Cheng, JS (Cheng, Jie-Shun) [1] , [4] ; Zhang, B (Zhang, Bao) [1] , [4]

FOOD CHEMISTRY
Volume
340
Article Number
127893
DOI
10.1016/j.foodchem.2020.127893
Published
MAR 15 2021
Indexed
2021-01-05
Document Type
Article

Abstract

In this work, zein/carboxymethyl dextrin nanoparticles were successfully fabricated at different zein to carboxymethyl dextrin (CMD) mass ratios. Zein/CMD nanoparticles with the negative charge and the smallest size (212 nm) were formed when the mass ratio of zein to CMD was 2:1, exhibiting improved encapsulation efficiency of curcumin (85.5%). Electrostatic interactions, hydrogen bonding and hydrophobic interactions were main driven forces for nanoparticles formulation and curcumin encapsulation. Fourier transform infrared spectroscopy determined curcumin might be partially embedded in CMD during encapsulation. The spherical structures of zein/CMD nanoparticles and curcumin-loaded zein/CMD nanoparticles were observed by transmission electron microscopy. The photothermal stability and antioxidant activity of curcumin were significantly enhanced after be loaded in zein/CMD nanoparticles. Furthermore, encapsulation of curcumin in zein/CMD nanoparticles significantly delayed the release of curcumin in simulated gastrointestinal fluids. These results indicated that zein/CMD nanoparticles could be effective encapsulating materials for bioactive compounds in food industry.

Keywords
Author Keywords
ZeinCarboxymethyl dextrinNanoparticlesCurcuminStability
Keywords Plus

Nanoparticles

PROPYLENE-GLYCOL ALGINATESTARCH COMPLEX NANOGELSIN-VITRO RELEASECHITOSAN NANOPARTICLESDELIVERY VEHICLESSTRUCTURAL-CHARACTERIZATIONCOMPOSITE NANOPARTICLESBINARY COMPLEXWHEY-PROTEINFABRICATION

24- Polyphenolic extracts from pomegranate and watermelon wastes as substrate to fabricate sustainable silver nanoparticles with larvicidal effect against Spodoptera littoralis

By:
Saad, AM (Saad, Ahmed M.) [1] ; El-Saadony, MT (El-Saadony, Mohamed T.) [2] ; El-Tahan, AM (El-Tahan, Amira M.) [3] ; Sayed, S (Sayed, Samy) [4] ; Moustafa, MAM (Moustafa, Moataz A. M.) [5] ; Taha, AE (Taha, Ayman E.) [6] ; Taha, TF (Taha, Taha F.) [1] ; Ramadan, MM (Ramadan, Mahmoud M.) [7]
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SAUDI JOURNAL OF BIOLOGICAL SCIENCES
Volume
28
Issue
10
Page
5674-5683
DOI
10.1016/j.sjbs.2021.06.011
Published
OCT 2021
Early Access
SEP 2021
Indexed
2021-10-14
Document Type
Article

Abstract

The agricultural wastes adversely affect the environment; however, they are rich in polyphenols; therefore, this study aimed to employ polyphenol-enriched waste extracts for silver nanoparticles synthesis, and study the larvicidal activity of silver nanoparticles fabricated by pomegranate and watermelon peels extracts (PPAgNPs and WPAgNPs) against all larval instars of Spodoptera littoralis. The polyphenol profile of pomegranate and watermelon peel extracts (PP and WP) and silver nanoparticles was detected by HPLC. The antioxidant activity was estimated by DPPH, and FARP assays and the antimicrobial activity was evaluated by disc assay. The Larvicidal activity of AgNPs against Egyptian leaf worm was performed by dipping technique. The obtained AgNPs were spherical with size ranged 15-85 nm and capped with proteins and polyphenols. The phenolic compounds in silver nanoparticles increased about extracts; therefore, they have the best performance in antioxidant/reducing activity, and inhibit the growth of tested bacteria and yeast. The PPAgNPs were the most effective against the first instar larvae instar (LC50 = 68.32 mu g/ml), followed by pomegranate extract with (LC50 = 2852 mu g/ml). The results indicated that obvious increase in polyphenols content in silver nanoparticles enhance their

larvicidal effect and increasing mortality of 1st larval of S. littoralis Egyptian leafworms causing additive effect and synergism. We recommend recycling phenolic enriched agricultural wastes in producing green silver nanoprticles to control cotton leafworm that causes economic loses to crops. (C) 2021 The Author(s). Published by Elsevier B.V. on behalf of King Saud University.

Keywords

Author Keywords
Fruit peelsPolyphenolsSilver nanoparticlesAntioxidantAntimicrobialLarvicidal
Keywords Plus
LEAFWORM PRODENIA LITURAANTIMICROBIAL ACTIVITYANTIBACTERIAL ACTIVITYANTIOXIDANT ACTIVITYPEEL EXTRACTIONSACID

Nanoparticles

25- Three-dimensional porous reduced graphene oxide decorated with carbon quantum dots and platinum nanoparticles for highly selective determination of azo dye compound tartrazine

By:
Mehmandoust, M (Mehmandoust, Mohammad) [1] , [2] ; Erk, N (Erk, Nevin) [1] , [2] ; Karaman, O (Karaman, Onur) [3] ; Karimi, F (Karimi, Fatemeh) [4] ; Bijad, M (Bijad, Majede) [5] ; Karaman, C (Karaman, Ceren) [6]
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(provided by Clarivate)

FOOD AND CHEMICAL TOXICOLOGY
Volume
158
Article Number
112698
DOI
10.1016/j.fct.2021.112698
Published
DEC 2021
Early Access
DEC 2021
Indexed
2022-02-20
Document Type
Article

Abstract

In this work, an electrochemical sensor for the azo dye compound tartrazine (TRT) determination was proposed. A screen-printed carbon electrode (SPCE) was modified by depositing three-dimensional porous reduced graphene oxide decorated with carbon quantum dots and platinum nanoparticles (Pt/CQDs@rGO/SPCE). The resulting amount of TRT was observed by differential pulse voltammetry. Under optimal conditions, the sensor exhibited two wide linearities ranging from 0.01 to 1.57 mu M and 1.57-9.3 mu M with the reliability coefficient of determination of 0.991 and 0.992, respectively. The detection limit (LOD) was also estimated to be 7.93 nM. Moreover, the Pt/CQDs@rGO/SPCE suggested high selectivity in the presence of several interfering agents and azo dye compounds that have a similar structure. Additionally, the Pt/CQDs@rGO/SPCE revealed superior recovery values of about 96.5-101.6% for candy, 99.7-103.5% for soft drinks, 96.0-101.2% for jelly powder, and 98.0-103.0% for water samples. Furthermore, the fabricated sensor exhibits excellent selectivity, stability, reproducibility, and repeatability, indicating a great perspective in the monitoring of TRT. Therefore, it can be speculated that the proposed electrode could be effectively applied to determine TRT in food samples.

Keywords

Nanoparticles

Author Keywords
Azo dyeTartrazineCarbon quantum dotsThree-dimensional graphene oxideScreen-printed carbon electrodeElectrochemical sensor
Keywords Plus
SUNSET YELLOWLIQUID-CHROMATOGRAPHYSOFT DRINKSELECTROCHEMICAL DETERMINATIONGRAPHITE OXIDEFOOD SAMPLESSENSORELECTRODEREDUCTIONCOLORANTS

Nanoparticles

26- Preparation of core-shell heterojunction photocatalysts by coating CdS nanoparticles onto Bi4Ti3O12 hierarchical microspheres and their photocatalytic removal of organic pollutants and Cr(VI) ions

By:
Cheng, TT (Cheng, Tingting) [1] ; Gao, HJ (Gao, Huajing) [1] ; Liu, GR (Liu, Guorong) [1] ; Pu, ZS (Pu, Zhongsheng) [1] ; Wang, SF (Wang, Shifa) [2] ; Yi, Z (Yi, Zao) [3] ; Wu, XW (Wu, Xianwen) [4] ; Yang, H (Yang, Hua) [1]
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COLLOIDS AND SURFACES A-PHYSICOCHEMICAL AND ENGINEERING ASPECTS
Volume
633
Part
2
Article Number
127918
DOI
10.1016/j.colsurfa.2021.127918
Published
JAN 20 2022
Early Access
NOV 2021
Indexed
2021-11-30
Document Type
Article
Jump to
Enriched Cited References

Abstract

Herein we have assembled CdS nanoparticles onto the surface of Bi4Ti3O1 (BTO) hierarchical microspheres to construct core-shell BTO/CdS heterojunction photocatalysts. The as-prepared samples are systematically analyzed by various methods (e.g., XRD, SEM, TEM, XPS, UV-vis DR spectroscopy and FTIR spectroscopy), confirming the formation of core-shell structured BTO/CdS composites. Photocurrent response and EIS analyses demonstrate that enhanced separation of photogenerated electron-hole pairs is realized in the BTO/CdS heterojunctions. Simulated-sunlight driving photodegradation of methylene blue (MB) reveals that the optimal composite sample 20%BTO/CdS is endowed with a photocatalytic activity about 1.6 and 3.3 times higher than that of bare CdS and BTO, respectively. Moreover, the 20%BTO/CdS heterojunction photocatalyst also exhibits excellent photocatalytic elimination of methyl orange (MO)/rhodamine B (RhB)/MB mixture dyes, ciprofloxacin (CIP), sulfamethoxazole (SMX),

tetrabromobisphenol A (TBBPA) and Cr(VI) ions. The enhanced photocatalytic mechanism of the BTO/CdS heterojunction photocatalysts was discussed based on a Z-scheme carrier transfer process.

Keywords
Author Keywords
CdS nanoparticlesSphere-like BTO hierarchical architecturescore-shell CdSBTO heterostructuresPhotocatalytic performancesZ-scheme mechanism
Keywords Plus
DEGRADATIONPERFORMANCENANOCRYSTALSFABRICATIONGRAPHENEMETAL

27- Impacts of Supplementing Broiler Diets with Biological Curcumin, Zinc Nanoparticles and Bacillus licheniformis on Growth, Carcass Traits, Blood Indices, Meat Quality and Cecal Microbial Load

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(provided by Clarivate)

ANIMALS
Volume
11
Issue
7
Article Number
1878
DOI
10.3390/ani11071878
Published
JUL 2021
Indexed
2022-02-10
Document Type
Article
Jump to
Enriched Cited References

Abstract

Simple Summary The present study aimed to investigate the beneficial effects of zinc nanoparticles (ZnNPs) and curcumin nanoparticles (CurNPs) as well as Bacillus licheniformis (Bl) supplementation on broiler growth, chemical blood indices, and cecal microbes. The results showed considerable antimicrobial activity against pathogenic bacteria and fungi with ZnNPs and CurNPs supplementations. At the same time, ZnNPs, CurNPs, and Bl improved broiler performance, carcass traits, meat quality traits, and some blood indices. Therefore, the inclusion of ZnNPs, CurNPs, and Bl is recommended for broiler feeding regimens to improve the performance and health status. The current study aimed to investigate the influence of dietary zinc nanoparticles (ZnNPs), curcumin nanoparticles (CurNPs), and Bacillus licheniformis (Bl) on the growth, carcass, blood metabolites, and the count of some cecal microorganisms of Indian River (IR) broilers. Chicks were allotted into seven experimental groups: control group, 1st, 2nd and 3rd groups were given diets enriched with ZnNPs, CurNPs and Bl (3.0, 5.0 and 2.0 cm(3)/kg diet, respectively). The 4th, 5th and 6th groups were given diets supplemented with ZnNPs (3.0) + Bl (2.0) (ZP);

ZnNPs (3.0) + CurNPs (5.0) (ZC) and ZnNPs (3.0) + CurNPs (5.0) + Bl (2.0) (ZCP) cm(3)/kg diet, respectively. The results revealed that ZnNPs and CurNPs exhibited a considerable antimicrobial activity against pathogenic bacteria and fungi. They also inhibited the growth of microbes in a range of 50-95 mu g/mL. The diet supplemented with ZnNPs, CurNPs, and Bl increased the body weight compared to the control after five weeks of age. Additionally, values of daily feed intake increased in these groups; however, the feed conversion ratio decreased. All values of carcass traits were better than that of the control. The treatments led to decreased abdominal lipids compared to the control. The activity of liver enzymes and malondialdehyde (MDA) activity decreased in the treated groups. In a converse trend, the levels of oxidative enzymes, amylase, protease, lipase and immunoglobulin were higher than that of the control. Meat quality properties were improved and cecal microbial counts were decreased. In conclusion, the ZnNPs, CurNPs, and Bl improved the broiler's weights, carcass traits, meat quality traits, as well as some blood indices and cecal microbial load. Therefore, the inclusion of ZnNPs, CurNPs, or Bl is recommended for broiler feeding regimens to improve the performance and health status.

Keywords

Author Keywords
ZnNPsCurNPsBacillusbroilersgrowthmicrobial aspects
Keywords Plus
OXIDE NANOPARTICLESANTIMICROBIAL ACTIVITYPERFORMANCEANTIOXIDANTTOXICITYANTIBACTERIALPROTEINACCUMULATIONMETABOLISM MODULATION

28- Enhancement in Thermal Energy and Solute Particles Using Hybrid Nanoparticles by Engaging Activation Energy and Chemical Reaction over a Parabolic Surface via Finite Element Approach

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FRACTAL AND FRACTIONAL
Volume
5
Issue
3
Article Number
119
DOI
10.3390/fractalfract5030119
Published
SEP 2021
Indexed
2021-10-06
Document Type
Article
Jump to
Enriched Cited References

Abstract

Several mechanisms in industrial use have significant applications in thermal transportation. The inclusion of hybrid nanoparticles in different mixtures has been studied extensively by researchers due to their wide applications. This report discusses the flow of Powell-Eyring fluid mixed with hybrid nanoparticles over a melting parabolic stretched surface. Flow rheology expressions have been derived under boundary layer theory. Afterwards, similarity transformation has been applied to convert PDEs into associated ODEs. These transformed ODEs have been solved the using finite element procedure (FEP) in the symbolic computational package MAPLE 18.0. The applicability and effectiveness of FEM are presented by addressing grid independent analysis. The reliability of FEM is presented by computing the surface drag force and heat transportation coefficient. The used methodology is highly effective and it can be easily implemented in MAPLE 18.0 for other highly nonlinear problems. It is observed that the thermal profile varies directly with the magnetic parameter, and the opposite trend is recorded for the Prandtl number.

Keywords
Author Keywords

Nanoparticles

mathematical modelingordinary and partial differential equationsparametric investigationfinite element techniquegrid independent investigationthermal enhancement

Keywords Plus

POWELL-EYRING FLUIDSHAPE FACTORFLOWSIO2/H2OMOS2

29- Amelioration of salt induced toxicity in pearl millet by seed priming with silver nanoparticles (AgNPs): The oxidative damage, antioxidant enzymes and ions uptake are major determinants of salt tolerant capacity

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PLANT PHYSIOLOGY AND BIOCHEMISTRY
Volume
156
Page
221-232
DOI
10.1016/j.plaphy.2020.09.018
Published
NOV 2020
Indexed
2020-12-03
Document Type
Article

Abstract

Abiotic stresses in plants reduce crop growth and productivity. Nanoparticles (NPs) are effectively involved in the physiochemical processes of crop plants, especially under the abiotic stresses; whereas, less information is available regarding the role of AgNPs in salt-stressed plants. Therefore, in the current study, we investigated the effects of seed priming with commercially available silver nanoparticles (AgNPs) (size range between 50 and 100 nm) on plant morphology, physiology, and antioxidant defence system of pearl millet (Pennisetum glaucum L.) under different concentrations of salt stress (0, 120 and 150 mM NaCl). The seed priming with AgNPs at different levels (0, 10, 20 and 30 mM) mitigated the adverse impacts of salt stress and improved plant growth and defence system. The results demonstrated that salt-stressed plants had restricted growth and a noticeable decline in fresh and dry weight. Salt stress enhanced the oxidative damage by excessive production of hydrogen peroxide (H2O2), malondialdehyde (MDA) contents in pearl millet leaves. However, seed priming with AgNPs significantly improved the plant height growth related attributes, relative water content, proline contents and ultimately fresh and dry weight at 20 mM AgNPs alone or with salt stress. The AgNPs reduced the oxidative damage by improving antioxidant enzyme activities in the pearl millet leaves under salt stress. Furthermore, sodium (Na+) and

Na+/K+ ratio was decreased and potassium (K+) increased by NPs, and the interactive effects between salt and AgNPs significantly impacted the total phenolic and flavonoid content in pearl millet. It was concluded that seed priming with AgNPs could enhance salinity tolerance in crop plants by enhancing physiological and biochemical responses. This might boost global crop production in salt-degraded lands.

Keywords

Author Keywords
Silver nanoparticlesSeed primingAntioxidantsPlant growthSalinity
Keywords Plus
GLUTATHIONE-REDUCTASESALINITY
TOLERANCESTRESSDROUGHTPLANTSZINCAVAILABILITYALLEVIATIONPEROXIDASEMECHANISMS