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Original Research Article

Green Preparation of Jasmine Oil Mediated Bovine Serum Albumin Nanodiscs/nanocubes

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Abstract: The preparations of various metal and polymeric nanoparticles were under scientific considerations these days to get the controllable geometry of prepared nanostructures with the ease of their smallest size at nanoscale. Many chemically modified nanoparticles such as nanosphere, nanodiscs, nanocubes, nanowires and nanorods are going to be fabricated with many biocompatible and nontoxic biomaterials (carbon nanotubes, chitosan, albumin and lipopolysaccharides and polysaccharides) or metals ions (gold, silver, iron and copper). These fabricated biomaterials and tagged metal ions were found to improve the oxidative etching effect in nanostructures (nanodiscs/nanocubes) that play very important role in manipulation of nanostructure geometry and their analysis. Bovine serum albumin was found to report a biocompatible, easy biodegradable and cost effective matrix for preparing the nanoparticles due to its well known exploitable characteristics e.g. biocompatibility, non-antigen city and non-toxicity. Hence, this study can provide an potential approach of green synthesis to control the shape of biocompatible bovine serum albumin nanodiscs/nanocubes by using jasmine oil as naturally occurring cheap and easily available emulsifier. Characterization of prepared bovine serum albumin was performed by using Scanning Electron Microscopy (SEM) to observe the prepared nanodiscs/nanocubes which had been going to be minimized to the expected size at nanoscale. So, this designed method can be proved a cost effective and green method to prepare non-toxic and biocompatible bovine serum albumin nanostructures to explore further their therapeutic applications being as nonviral gene or drug nanocages to carry out the site specific targeted delivery.
Keywords: Bovine serum albumin; Jasmine oil; Nanocubes; Nanodiscs, Scanning Electron Microscopy.

INTRODUCTION

A rapid synthesis of a large quantity of uniform-sized gold nanocubes was also demonstrated in which electrochemical method was used with a surfactant solution and acetone. The gold nanocube edge was observed of about 30nm30nm long with truncated structures as observed by using high-resolution transmission electron microscopy analysis [1]. Carbon-supported Pd nanocubes were also chemically synthesized with having varying sizes of e.g. 30, 10 and 7 nm and their electro catalytic activity towards the oxygen reduction reaction (ORR) in alkaline solution was also studied. For comparison carbon-supported spherical Pd nanoparticles and commercial Pd/C catalyst were used. And, it was found that the specific activity of Pd nanocubes was more than two times higher than that of spherical Pd nanoparticles [2]. Two seed-mediated approaches were also developed previously used for the growth of silver nanocubes in aqueous solution with the addition of a silver-seed solution to a mixture of cetyl trimethyl ammonium chloride (CTAC), silver trifluoro acetate and ascorbic acid. Cub octahedral Au/Ag and Au nanocages and nanoframes were prepared with empty faces through a galvanic replacement reaction using chemical synthesis [3]. Carbon nanocubes and nanobricks were also synthesized by using pyrolyzing rice powder at 600 °C under nitrogen atmosphere and characterized by XRD pattern that showed the 0.15 mol/g basic graphitic structure of these nano carbon materials. As well as, their SEM and TEM images were revealed cube or brick shaped nano-crystals. Solid state electronic spectrum was also carried out to that showed several bands in the ultraviolet and visible region and excitation at 336 and 474 nm which generate photoluminescence respectively in the ultraviolet and visible region [4]. The geometry and shape of nanocubes are found to be affected by varying the concentration of used catalysts such as metals ions, polymers and albumin that directly affects the properties of the localized surface plasmon resonance and surface-enhanced Raman scattering. The process of development of facial synthetic routes for fabrication of multimetallic or polymeric nanostructures such as nanocubes, nanodiscs, nanobricks, nanowires and nanorodes are found to be big challenge to optimize it at

their nanoscale with desired geometry [5]. Other polymeric nanoparticles were selected for loading of desired enzymes or drugs into biocompatible and cost effective matrix which were chitosan, gelatin, sodium alginate, ficoll, sepharose and albumin that are proposed to be used for nano-therapeutic approaches as more suitable targeted nonviral delivery vehicles [5-7]. Cationic bovine serum albumin based self-assembled nanoparticles as siRNA delivery vector was also prepared and had been used for treating lung metastatic cancer as low cost and nontoxic nonviral gene delivery vehicle [6,7]. Various drug targeting nanovehicles had been proposed to be used as most potential site specific delivery of loading ingredients. That was found to be expected good biodegradable, rapid and reasonably cheap nanobiomaterials to prepare nanostructures having high loading capacity for prolonged circulation at specific target sites in host cell [7-10]. Various modified green and chemical methods had been proposed to prepare bioactive stable enzyme or drug loaded nano-BSA and Egg nanoparticles that can be further successfully used as echo-friendly preservative, non-toxic drug delivery trigger to deliver the loaded biological and chemical materials at targeted sites [10-15].

Hence, this brief study was proposed to develop the cost effective and non-toxic green synthetic practice used for the synthesis of bovine serum albumin nanostructures such as nanodiscs/ nanocubes by using jasmine oil as low-cost, easily available, non-allergic, and antioxidative and antibactericidal biocatalyst. Characterization of synthesized jasmine oil mediated bovine serum albumin nanodiscs/nanocubes was carried out with scanning electron Microscopy (SEM) for the observation of their size. These bovine serum albumin nanobricks/nanocubes prepared by this green method may be used as echo-friendly and non-toxic drug and gene delivery nonviral nanocages or nanoframes when any desired drugs/biological/formulated chemical materials/gene might be bind into them. These formulated bovine serum albumin nanobricks and nanocubes can be used as safe preservatives in many pharmaceutical preparations and potent targeted drug delivery nonviral vehicle that can be used in desired clinical therapeutic approaches.

MATERIALS AND METHODS

Green Preparation of almond oil mediated bovine serum albumin nanobricks/nanocubes

Jasmine oil bath was prepared with slight modification of previous methods used by Rani, K and Chauhan, C., 201513; Rani, K and Chauhan, C., 201514; Rani, K, 201515. For preparing oil bath, 8-10 ml of bovine serum albumin was taken in 10 gauge syringe and added into the prepared 50 ml of jasmine oil bath. Then, it was incubated overnight with constant stirring. Next day, it was further subjected to sonication for 25 minutes with 2.6 ml of n-butanol with slight modification to minimize the size and structure of nanostructures [13-15].

Characterization of jasmine oil mediated bovine serum albumin nanodiscs/nanocubes by Scanning Electron Microscopy (SEM)

The prepared bovine serum albumin nanodiscs/nanocubes were subjected to Scanning Electron Microscopy (SEM) for the interpretation of their particle size [13-15].

RESULT AND DISCUSSION

Characterization of jasmine oil mediated bovine serum albumin nanodiscs/nanocubes by Scanning Electron Microscopy (SEM)

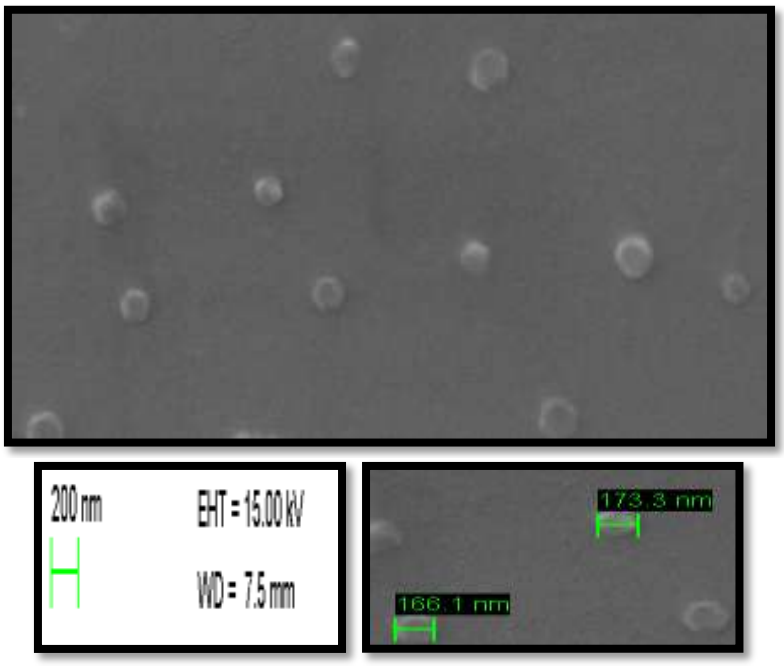

Fig. 1: SEM result of jasmine oil mediated bovine serum albumin nanodiscs/nanocubes

Characterization of jasmine oil mediated bovine serum albumin nanodiscs/nanocubes was carried out by using SEM for assigning their size and exhibited shapes (Fig 1). SEM observations of prepared bovine serum albumin nanodiscs/nanocubes was found to be observed their size in the range of 166.1 nm to 173.3 nm with exhibited cubical and discs shaped prepared bovine serum albumin nanostructures (Fig 1). Their SEM observations for their sizes are very much comparable with previous studies [7, 13, 14].

CONCLUSION

In this small study, green preparation of bovine serum albumin nanodiscs/nanocubes was proposed by using jasmine oil which is affordable and natural biocatalyst for this method. And their characterization was done with SEM that accounted their exhibited size and geometry of nanocrystals. Hence, it was concluded that this green biopreparation of bovine serum albumin nanodiscs/nanocubes preparation is found to be safe, eco-friendly; non-toxic, non-allergic and cheap green method over other used chemical methods of preparing nanostructures. As well as, this method can be employed for the preparation of bovine serum albumin nanostructures that might be further used for various clinical, pharmaceutical and therapeutic applications by employing advanced characterizations methodologies with nanostructures geometry optimizations and improved fabrications with ease of tagging and loading of other metals and desired payloads such as drugs, enzymes, antibiotics, spliced gene respectively. And, these might be used as safe and potent nonviral gene and drug delivery carriers.

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