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Advanced Materials 2018: Preparation of metal-complexed mesoporous carbon membrane using monodispersed silica nanoparticles- Jihyun Bae- Hannam University

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Mesoporous materials are applied in various fields like catalysts, supports for nanomaterials, adsorption and separation, and sensors. one among the details for a few applications is to regulate the pore size or the pore structure counting on the aim . it's necessary to regulate the dimensions of the pores consistent with the dimensions of the molecules or substances entering the pores of the mesoporous material. Also, it's vital that the change of the fabric constituting of the skeleton and therefore the properties of the mesoporous material counting on the aim of use. The mesoporous carbon material is predicted to be applied in fields like electrode materials of a cell because it's a area of 1,000 to 2,000 m2/g, excellent thermal stability, absorption and performance as a carrier. Especially, mesoporous materials are mostly utilized as catalysts or adsorbents because they need uniform nanopores. Despite its many advantages, the carbon material is weak in strength counting on the orientation and is definitely cracked and features a low applicability generally . during this study, a mesoporous carbon membrane supported silica nanoparticle was prepared. Various synthesis parameters were systematically investigated to review the consequences on the dimensions and therefore the size distribution of silica nanoparticles. The silica nanoparticles were pressurized into a disk then calcinated to get a mesoporous carbon membrane. Then the membrane was chemically treated with COOH group, and Ag was complexed on the surface of the membrane. additionally , our study suggests a replacement method to repair the metal to the surface of the mesoporous carbon membrane also on increase the strength of them. Introduction: Modern nanotechnology has evolved because the principal component of science within the current century. Over the years, diagnosis of diseases and its therapy is consistently leaping milestones thanks to the application of nanotechnology within the field of biomedicine. The evolution of nanomedicine and green technology for its production has been an excellent boon and have shifted paradigms in therapy and tissue engineering, due to the benefits of nanocarriers like a high area to volume ratio, unique features of surface modification and engineering to get particles of varied sizes, shapes and different chemical characteristics. These have proven to be biocompatible, biodegradable and non-toxic which adds to its advantages. Lipid-based nanocarriers, polymeric nanoparticles, dendrimers have revolutionized the therapy for various conditions especially cancer and infectious diseases. Many of those products are approved and are commercially available. Apart from the above mentioned organic nanoparticles, inorganic nanoparticles have also been widely explored for his or her application in biomedicine. Out of them, quantum dots, iron oxide nanoparticles are approved and are commercially available. Carbon dots, nanoparticles of gold, silver, various other metal oxides, layered double hydroxide nanoparticles and silica nanoparticles have been widely used for various diagnostic and therapeutic purposes. Of these, silica nanoparticles comprising of organic dyes and radioactive iodide referred to as Cornell dots (C dots) has successfully attained a crucial benchmark of safety by its approval for phase I clinical trial human trials which is vital for any substance requiring Investigational New Drug (IND) approval. C dots are core-shell silica nanoparticles containing fluorescent molecules within the silica core surrounded with silica shell which is further coated with polyethylene glycol (PEG). C dots were first developed by Spencer T. Olin Professor of Engineering, Ulrich Wiesner from Department of Materials Science and Engineering at Cornell University. Silica nanoparticles with mesopores–referred to as mesoporous silica nanoparticles (MSNs)–have gained wide popularity over the recent years. Its advantages of uniform and tunable pore size, easy independent unctionalization of the surface, internal and external pores and therefore the gating mechanism of the pore opening make it a particular and promising drug carrier.

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