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Nanoparticle-based colloidal delivery systems: Thermosensitive hydrogels containing self-assembled micelles

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Advanced drug delivery and targeting has seen spectacular achievements over recent years to overcome many obstacles in the way of timing and targeting the delivery to fulfill therapeutic potentiality of chemicals. The purpose of this investigation was to prepare and characterize novel polymeric nanoparticle-based products aimed at using for rate-controlled release, prolonged/sustained release, and targeted/spatial drug delivery systems. The products were formulated with sodium carboxymethylcellulose (NaCMC), some types of polysorbates, and glycerol. The synthesis process was performed by heating/cooling method, as a type of physical cross-linking method for producing hydrogel, in three steps to optimize physical and chemical characteristics. A series of nanoparticle-based colloidal products as liquid suspensions were developed, and from all three steps, about forty types were selected and investigated rheologically by bench-top experiments. Afterwards, two samples of product type III10 underwent a freeze-thawing method for five and one repeated cycles sequentially. Test tube inversion method was carried out on all the produced gels. Most of the products were new types of temperature-sensitive, smart, physically self-assembled hydrogels and took the forms of sol, gel (opaque and transparent), and precipitate. However, these hydrogels showed opposite gelation property to customary temperature-sensitive gels. The product of five repeated freezing-thawing cycles was also thermoreversible gel with a high mechanical stability and swelling capacity, as opposed to the product of one cycle. Some types of produced hydrogels behaved like a ternary system. These intelligent hydrogels take the major advantage of gelation property of NaCMC and micelle formation of polysorbates.

Biography

Mohammad Nasri completed his Medical Doctorate (MD) in a seven years and a half course of study from Kerman University of Medical Sciences, Kerman, Iran. He has been involved as an interdisciplinary researcher in some multidisciplinary research topics in this university during the past years. His main field of research has been on Biomedical engineering, Drug delivery and transport, Novel routes of delivery, Delivery via the mucosal routes, Targeting and optimizing pulmonary delivery, Pharmaceutical sciences, and Rheology. He has conducted a group of original researches on a novel group of polymer-based colloidal drug delivery and release systems.

Synthesis of various biologically relevant heterocycles by metal nanoparticles

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Nanotechnology is of growing importance in many branches of research because of the opportunity for miniaturization and the interesting properties associated with small particle size. In recent decades, nanostructures materials have attracted much attention for their novel electronic, magnetic, optical, chemical, and mechanical properties and catalysis. Control of the surface properties and reactivates of metal nanoparticles is an important aspect of developing nanomaterial applications. The size, shape, and surface properties of metal nanoparticles are crucially controlled by the nature of protective ligands. The physical and chemical properties of metal nanoparticles can be tuned by variations in both the nature of the ligand shell, and the size of the metal core. Generally, transition metal nanoparticles with small particle size have high catalytic activity and obvious size-dependent properties. Heterocyclic compounds are widely distributed in nature. Many are of fundamental impor¬tance to living system and find wide range of applications: they are predominant among the types of compound used as pharmaceuticals, agrochemicals and as veterinary products. Many types of the synthesis of these heterocyclic compounds are reported in literature and they have their own merits and difficulties. Most prominent disadvantages are use of toxic and costly catalysts which are non recoverable. Keep this thing in mind and also make the procedure more industrially viable we applied nanoparticles as an efficient catalyst for the synthesis of biologically important compounds. One of the most noticeable advantages is that nanoparticles can easily be recycled and reused for several runs.

Biography

Amarta Kumar Pal has completed his PhD in 2007 from Kalyani University and did his postdoctoral studies from Academia Sinica, Taiwan After that he joined in Department of Chemistry, North Eastern Hill University, Shillong, India as an Assistant Professor (2009). He has published 22 papers in reputed journals. He is the member of Indian Science Congress.

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