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Environmental Chemistry 2019: Synthesis of fine silver nanoparticles on bio functionalized graphene oxide for effective antibacterial activity - Rasoul Bolghar - Azarbaijan Shahid Madani University

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Abstract

Graphene-supported metal nanoparticle composites as a hybrid material have stimulated extensive interest due to their synergistic and novel properties. Several strategies have been developed for the synthesis of metal particles on graphene. In this work, Ag NPs was supported onto GO sheets via grafted cysteine. The antibacterial potential of silver nanoparticles in the graphene oxide nanocomposites with a modified surface by cysteine (rMGO-Ag) as an amino acid is the subject of discussion for this research. Samples were prepared with different synthesis method that caused to the smaller size of Ag NPs onto the GO and caused to increase efficiency and improve antibacterial property of nanocomposite. Graphene oxide (GO) is a potential material that becomes interesting with many applications, one of them is antibacterial treatment. The Procedures of antibacterial may occur GO traps bacteria while Ag destroys bacteria. Hence, the combination of GO and Ag NPs is an efficient material due to biocompatibility and antibacterial properties. Cysteine by having functional groups can act as modifier and reducing agent in the preparation of metal and graphene oxide nanocomposites. As well as its three kinds of functional group (-SH, -NH2 and –COO-) can be a site for supporting heavy metal nanoparticles by non-covalent bonding. Cysteine can have two roles in rMGO-Ag nanocomposite: i) has ability to nucleophilic attack on rGO sheets with Amin functional group, ii) via thiol functional group, it has reducing potential to GO and moreover ability to establish Ag nanoparticles by noncovalent bond.

The antibacterial behavior of silver nanoparticles in the graphene oxide with a modified surface by Cysteine (rMGO-Ag) as an amino acid is the subject of discussion for this research. The resulted nanocomposite was fully characterized by different techniques, physical properties were confirmed by X-ray diffraction (XRD), zeta potential, dynamic light scattering (DLS), Fourier transform infrared (FTIR) spectra, transmission electron microscopy (TEM) and scanning electron microscopy(SEM).

Silver has a lot of present day modern uses and is viewed as a store of riches. Be that as it may, the narrative of this amazing valuable metal starts with its utilization by antiquated developments. Silver has numerous properties that made it so significant to early people groups. It is pliable, bendable, shiny, versatile, conductive, antibacterial, and uncommon. Additionally, it was utilized as a valuable product in monetary forms, adornments, gems, electrical contacts and photography, among others. In spite of the fact that mass silver is broadly known for their splendid surfaces and hues, there is an extraordinary shading distinction when the metal decreases in measurements. Despite the fact that the skilled workers didn't know nanoparticles in that period, the blending of the metal chlorides with liquid glass prompted the development of metallic nanoparticles of various shape and size, in this manner the physical configurations of the metal nanoparticles had fascinating associations with light and delivered noticeably delightful hues. The metal chlorides emerged and framed nanoparticles in the liquid glass before cooling, making craftsmanship, one of the primary uses for nanotechnology. These days, the nanoparticles are a significant field of the advanced research managing plan, amalgamation, and control of molecule structures extending from around 1 to 100 nm. Nanoparticle investigate is as of now a territory of extraordinary logical research, because of a wide assortment of likely applications in fields, for example, human services, beautifiers, food and feed, ecological wellbeing, mechanics, optics, biomedical sciences, concoction ventures, hardware, space businesses, medicate quality conveyance, vitality science, optoelectronics, catalysis, single electron transistors, light producers, nonlinear optical gadgets, and photograph electrochemical region. The silver nanoparticles have been generally utilized in the fields of science and related branches because of their high surface to volume proportion and magnificent directing capacity. From electrical switches, sunlight based boards to compound creating impetuses and antimicrobial action, the silver nanoparticle is a fundamental segment in numerous ventures. Its one of a kind properties make it about difficult to substitute and its uses contain a wide scope of uses. Simultaneously, a significant number of the shopper items that guarantee to contain nanomaterials contain nanosilver. Instances of the purchaser items that incorporate nanosilver including PCs, cell phones, car machines, food bundling materials, food supplements, materials, hardware, family unit apparatuses, beauty care products, clinical gadgets, imaging methods, and water and condition disinfectants. The greater part of these nanosilver-containing items are produced in North America, the Far East, particularly in China, South

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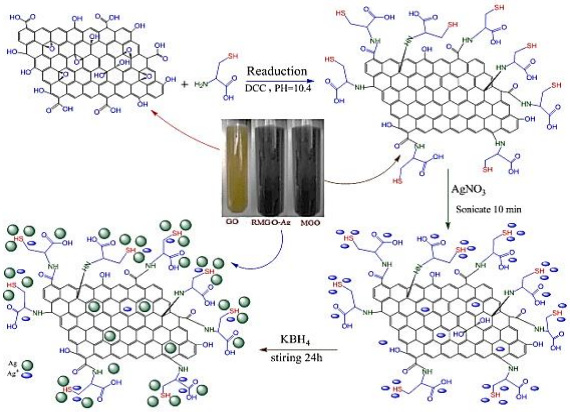
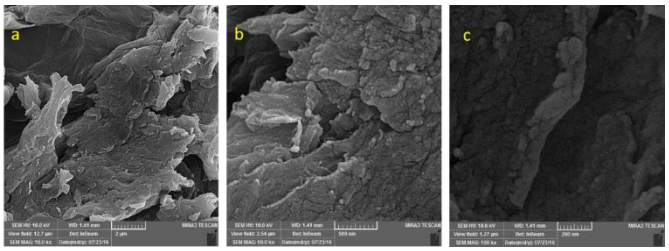
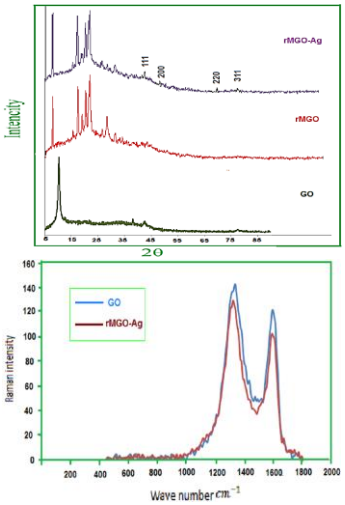
Korea, Taiwan, Vietnam and India, the Russian Federation, and the Western Europe.

The information on the silver nanomaterials amalgamation strategies is significant because of a broad application and territory of utilization point of view. The principle issue in orchestrating the silver nanoparticles is the control of their physical properties, for example, acquiring uniform molecule size conveyance, indistinguishable shape, morphology, nanoparticle covering or balancing out specialist, concoction organization or type and precious stone structure. The techniques can be arranged and classified that they follow regular methodologies and the distinctions, for example, reactants and the response conditions. Top-down versus base up, green versus nongreen, and customary versus nonconventional union techniques have been accounted for. The regular union techniques contain the utilization of citrate, borohydride, two-stage frameworks (water-natural), natural reducers, for example, cyclodextrin, and micelles and additionally polymer in the union procedure. The unusual strategies contain laser removal, radiocatalysis, vacuum dissipation of metal, light, photolithography, electrodeposition and the electrocondensation. Top-down and base up are the two combination approaches of metallic nanoparticles including synthetic, physical, and organic methods. The normal creation of the nanoparticles incorporates synthetic and physical procedures. The top-down methodology utilizes plainly visible introductory structures, which can be remotely controlled in the preparing of nanostructures. The nanoparticles combined by mechanical pounding of mass metals and the expansion of colloidal ensuring operators are a few instances of the top-down technique. The base up approaches contain the scaling down of materials segments (up to nuclear level) with further self-get together procedure. The decrease of metals, electrochemical strategies, and disintegration are the instances of the base up techniques. Furthermore, the amalgamation approaches can be named either green or non-green







Biography

Rasul Bulgar is a graduate student at the Shahid Madani University. I completed my master's degree in the field of Mesoporous as Catalyst in carbon-carbon bond formation reactions such as sonogashira, Heck, Hiyama and Suzuki reactions, and I am studying an anticancer drug in a silica nanoparticle at the Ph.D.