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Synthesis of fine silver nanoparticles on bio functionalized graphene oxide for effective antibacterial activity

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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).