Development of metal/carbon nanohybrid materials for the anti-bacterial and anti-biofilm applications

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Abstract

The chronic diseases caused by bacterial infections are challenging to be treated because of their inherent resistance to antibiotics. The biofilm is a polymeric conglomeration of extracellular polysaccharides, proteins, lipids and DNA of bacteria provides a rigid barrier that the external anti-bacterial reagents cannot easily penetrate into. Synergy effect of antibiotic resistant bacteria and biofilm make them more resistant to chemicals and antibiotics. In order to overcome the problems of bacterial resistance and biofilm formation, we aimed to prepare diverse metal nanoparticles synthesized on graphene oxide (GO) nanosheets. Silver nanoparticle are prepared on GO nanosheets that may be able to synergistically increase the efficacy of killing bacteria and destroying biofilms with the minimum amount of them to be biocompatible to mammalian cells. Prepared silver nanoparticle on GO nanosheets were characterized by X-ray diffraction(XRD), transmission electron microscopy(TEM), and Inductively Coupled Plasma-Mass Spectrometry(ICP-MS). The antibacterial activity was evaluated by colony counting assay and minimum inhibitory concentration against common bacteria samples. The anti-biofilm property of nanocomposites was tested in a microfluidic channel that has biofilm formed along the channel walls. Reported work showed the potential of silver nanoparticles on GO nanosheets in prohibiting the infectious bacteria and their biofilm.