SERS-active magnetic sorbents for removal and optical detection of penicillin G

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Serious concerns have been raised about the occurrence of antibiotics in the environment due to their potential risk to human health and aquatic ecosystem.[1] Particularly, such water contaminants contribute to the increased resistance of some pathogenic microorganisms to conventional antibiotics. In this context, recent developments in nanomaterials science and environmental nanotechnology have provided new methods for purification of trace pollutants in water. Our own interest in this field, led us to develop new colloidal sorbents for the removal of water contaminants via magnetic separation.[2,3] The upgrade of such sorbents for simultaneous use in water purification and contaminant detection is a challenging task but of great practical interest.

The present work aims the developing of SERS-active magnetic sorbents, as innovative platforms for magnetic removal and Raman analysis of penicillin G dissolved in water. Multifunctional nanomaterials combining magnetic and plasmonic components have been prepared by surface-modification of colloidal magnetite nanoparticles with siliceous shells enriched in dithiocarbamate groups[2], followed by adsorption of gold nanoparticles onto the nanoparticles surfaces.[3] The ability of such multifunctional sorbents to act as SERS platforms for the detection of penicillin G removal was then evaluated. Several analytical conditions have been investigated in order to optimize the SERS detection of penicillin G. Additionally, microscopic methods, including Raman confocal microscopy, have been employed to characterize the SERS substrates and respective monitoring process. These results will be discussed on a perspective of potential use of these materials for laboratory monitoring and water treatment units.

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