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OPTIMIZATION OF Ag NANOPARTICLES TOWARDS THE SEMI QUANTITATIVE DETECTION OF CIPROFLOXACIN IN AQUEOUS MEDIA BY SURFACE ENHANCED RAMAN SPECTROSCOPY

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Abstract

The increasing consumption of antibiotics has increased the antibiotic pollution in the environment. Even very low concentrations of antibiotics in aqueous medium can affect the human and nature to a large extent. A major problem that arises from the antibiotic pollution is the antimicrobial resistance. Therefore, detection and treatment of antibiotics are essential. Many studies have proven the presence of antibiotics inground and surface water. Although antibiotics are found in aqueous environments, the major issue in detecting these antibiotics is that they present in water in very low concentrations. According to recorded literature 1.270-1.344 ppb range has been detected using HPLC. Therefore, developing methods to detect antibiotics are essential. This study focuses on detecting ciprofloxacin in aqueous medium by Surface Enhanced Raman spectroscopy (SERS). Silver nanoparticles were synthesized by Leopold and Lendl method. Synthesized nanoparticles showed an UV-VIS absorption peak at 414 nm. Qualitative and semi-quantitative determination of ubiquitous Ciprofloxacin procedure was optimized by varying the Ag nanoparticle ratios and different aggregating agents like NaCl and $MgSO_4$. The ratio of 4:1 silver colloid to Ciprofloxacin gave the best enhancement along with the $MgSO_4$ as an aggregating agent. Different electromagnetic matrix conditions were provided by Different nanoparticle ratios and aggregating agents to perform the peak enhancement. Currently, concentrations of 2.5 ppm level were sensed with this triplicated optimized technique. Sharp peaks were appeared at 1357.2 cm^{-1}, 1389.1 cm^{-1}, 1479.7 cm^{-1} and 1630 cm^{-1} in the SERS spectrum of ciprofloxacin confirming the presence of ciprofloxacin in the studied sample. With further optimizations, this method could be served as a cost-effective novel technique in ultra-low detection and quantification of Ciprofloxacin in various environmental samples.

Keywords: *silver nanoparticles, Ciprofloxacin, SERS, ultra-low concentrations*