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Influence of Hydrogen Ion Concentration on the Production of Bio-Synthesized Nano-Silver

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Abstract : Silver nanoparticles (AgNPs) are already widely prepared using different technologies. However, there are limited data on the effects of hydrogen ion concentration on nano-silver production. In this investigation, the impact of the pH reaction medium toward the particle size, agglomeration and the yield of the produced bio-synthesized silver were established. Quasi-spherical silver nanoparticles were synthesized through the biosynthesis green production process using the Egyptian E. coli bacterial strain 23N at different pH values. The formation of AgNPs has been confirmed with ultraviolet–visible spectra through identification of their characteristic peak at 410 nm. The quantitative production yield and the orientation planes of the produced nano-silver were examined using X-ray spectroscopy (EDS) and X-ray diffraction (XRD). Quantitative analyses indicated that the silver production yield was promoted at elevated pH regarded to increase the reduction rate of silver precursor through both chemical and biological processes. As a result, number of the nucleus and thus the size of the silver nanoparticles were tunable through changing pH of the reaction system. Accordingly, the morphological structure and size of the produced silver and its aggregates were determined using scanning electron microscopy (SEM) and transmission electron microscopy (TEM) images. It was considered that the increment in pH value of the reaction media progress the aggregation of silver clusters. However, the presence of stain 23N biomass decreases the possibility of silver aggregation at the pH 7.

Keywords : silver nanoparticles, biosynthesis, reaction media pH, nano-silver characterization
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