Electrochemical Study, Structural Characterization and Antimicrobial Activity of Silver and Copper Oxide (CuO) Nanoparticles Synthesized by a Green Method Using L-ascorbic Acid and Chitosan

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An economical and facile green method for the synthesis of nanoparticles was employed to prepare silver and copper oxide nanostructures using L-ascorbic acid as the reducing agent. The effect of pH on the resulting nanoparticles was studied. The results show that with increased solution pH, the nanoparticles are larger, in the range of 19-50 nm for silver and 5-30 nm for copper oxide. The interplanar distances and selected area electron diffraction patterns show that both kinds of nanoparticles are highly crystalline. The silver nanocrystals present face-centered cubic structure, while the copper oxide nanoparticles have monoclinic structure. These results agree with those obtained in the electrochemical study since the peaks of the oxidation-reduction pairs correspond to Ag^0/Ag^+ for silver and Cu^0/Cu^+ and $\text{Cu}^+/\text{Cu}^{2+}$ for copper. Finally, the smallest copper oxide nanoparticles presented high antibacterial activity comparable with that of a conventional drug.

Keywords: Cyclic voltammetry, TEM, UV-Vis spectrophotometry, Silver nanoparticles, Copper oxide nanoparticles, Green synthesis, Antimicrobial activity

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