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The study of nanoparticles of Au₂O₃ using tannic acid

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This study was performed in order to determine the shape, size, and structure Au₂O₃ nanoparticles synthesized using the bio-reduction method, using tannic acid as a reducing agent, controlling the value of pH with the addition of NaOH, and working at room temperature. Oxidized gold nanoparticles have been subject of several studies since they are a matter of interest due to the different applications they have. However, it has been observed that when they are synthesized in aqueous solutions, they might get oxidized becoming at once an interesting subject of study. The solutions were prepared in 100 ml distilled water with a concentration of 0.3 mM of tannic acid, which was subjected to an ultrasonic treatment for 15 minutes. After fixing the pH, a solution of 0.3 mM of HAuCl₄ diluted in 100 ml of distilled water was added; the ultrasonic was used again for 15 minutes. The whole process was performed at room temperature. The characterization was performed by Transmission Electron Microscopy (TEM), high resolution transmission electron microscopy (HRTEM) both in a JEOL JEM-2010F FasTem, X-Ray Diffraction (XRD) in a Bruker D8 α-Cu and zeta sizer de Malvern. High resolution images were obtained under several different conditions and these were analyzed by obtaining digital spectra by FFT (Fast Fourier Transforms). The FFT was obtained from the images with the Digital Micrograph software and indexation was performed with the program DPIP. The analysis performed was developed in three stages in order to observe shape, structure and size of the particles. The study was also performed at different pH values; Au₂O₃ nanoparticles using tannic acid as reducing agent working with bio-reduction method were synthesized. The pH=12 was found to be the best to obtain a greater number of Au₂O₃ nanoparticles, which also showed that the nanoparticles were smaller at all pH values. Most of the particles had icosahedral shape that remained almost constant at all pH values. However, for certain values, triangular and star particle shapes were also found.

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