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MS-4-P-2089 The Study of Nanoparticles of Au2O3 using Tannic Acid and Gallic Acid

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It is attempted to determine the differences in shape, size, and structure between Au2O3 particles synthesized using the Bioreduction [1] method, using tannic acid or galic 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 [2], 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 are prepared in 5 ml distilled water with a concentration of 0.3 mM tannins (tannic acid or gallic acid), which has been subjected to an ultrasonic treatment for 1 minute. After fixing the pH, the solutions are taken to the ultrasonic cleaner again for 15 minutes and then centrifuged at 5000 rpm for 15 minutes. Afterwards, HAuCl4 deluted in 5 ml distilled water is added and for it to mix homogeneously, the ultrasonic cleaner is used again for 20 minutes before introducing it to the centrifuge at 5000 rpm for 20 more minutes. The whole process is performed at room temperature. Electron microscopy characterization included transmission electron microscopy (TEM), high resolution transmission electron microscopy (HRTEM). The samples were prepared by adding a drop of the solution on carbon-coated copper grids and then they were left to dry. Electron microscopy was performed in a JEOL JEM-2010F FasTem, equipped with analytical devices. High resolution images were obtained under several different conditions and the images were analyzed by obtaining digital spectra by FFT (Fast Fourier Transforms), to achieve more precise measurement. The FFT was obtained from the images with the Digital Micrograph software and indexation was performed with the program DPIP developed within our group [3]. The analysis performed was developed in three stages in order to observe size, structure and shape of the particles. Using the same molar proportions and fixing the pH value, we find that the number of particles in the case of the gallic acid is relatively smaller than the one obtained with tannic acid. The sizes and structures found in both cases are relatively similar. The study is also performed for different pH values. [1] R. Herrera-Becerra, J. L. Rius, y C. Zorrilla, Tannin biosynthesis of iron oxide nanoparticles, Applied Physics A. (2010) 453-459. [2] Luis K. Ono and Beatriz Roldan Cuenya, Formation and thermal stability of Au2O3 on gold nanoparticles: size and support effects, J. Phys. Chem., C 112, (2008) 4676-4686. [3] Galicia, R., Herrera, R., Rius, J L & Zorrilla, C. & Gómez, A., Revista Mexicana de Física 59, (2013)102–106.

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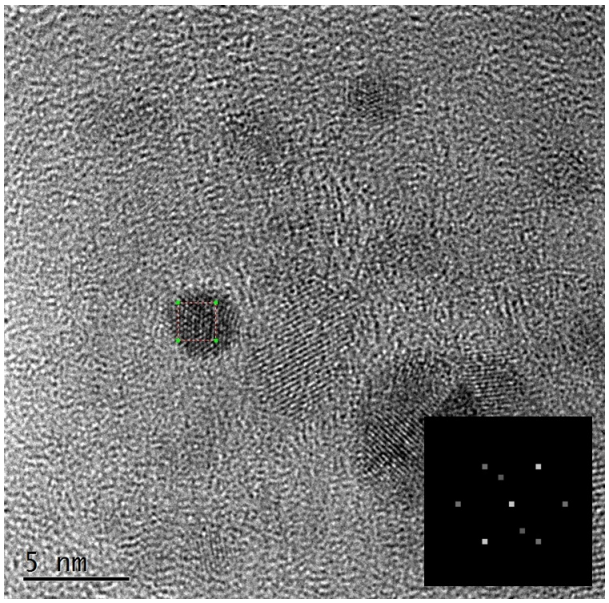

Fig. 1: HRTEM image of an Au2O3 particle and its FFT where tannic acid was used.

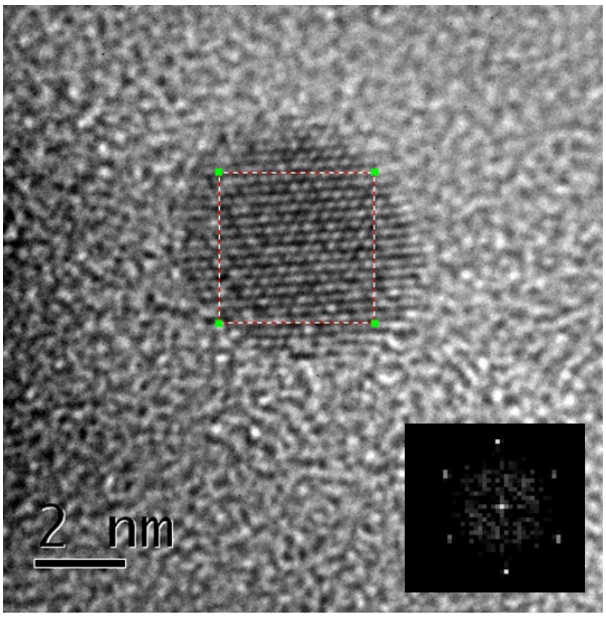

Fig. 2: HRTEM image of an Au2O3 particle and its FFT where gallic acid was used.