MS-1-P-3270 Oxidation study of silver nanoparticles

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During the last few years has been a great interest to develop new functional nanomaterials for diverse applications, including areas such as semiconductors, optical devices, photo-electrochemistry, among others [1]. It is well known that the formation of nanoparticles is highly sensitive to different the reaction conditions. Particularly, the control of shape and size of the nanoparticles are parameters of major importance for the different applications where they are used. One of the main physicochemical parameters that control the final size and shape of nanoparticles is the pH [2], resulting in the formation of Ag nanoparticles of different morphologies depending on precursors concentration at different pH values.

Silver nanoparticles (AgNP) have been subject of several studies due to their diverse applications; however, it has been observed that when AgNP are synthesized in aqueous solutions they might suffer oxidation that could derive in loss of activity[3].

In this work, we studied the oxidation of AgNP obtained in aqueous solutions, by employing a so-called "green" method for the production of nanoparticles, with especial focus on the characterization of forms and structures of AgNP. The method employed here is at room temperature, using synthetic tannins as principal reducing reagents and AgNO₃ as precursor in aqueous solution. During the reactions, the pH was modified by using NaOH solutions at low concentrations, obtaining different sizes and shapes of AgNP. The mixtures were subjected to ultrasonic treatment, centrifugation and drying. This straightforward method has proven its effectiveness in the reduction of metal nanoparticles on earlier work by our group [4].

It was observed that exist a critical stable size, after it AgNP have tendency to oxidize. Advanced analytical electron microscopy characterization will be employed to determinate the critical size and the final structure, shape, atomic arrangement and chemical composition of the AgNP produced by this method.

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