

Usefulness of silver nanotriangle formation for the simultaneous determination of ascorbic acid and gallic acid

M.A. Molina-Delgado^a, M.P. Aguilar-Caballos, A. Gómez-Hens

^aAnalytical Chemistry Department, Institute of Fine Chemistry and Nanochemistry, Faculty of Sciences, University of Cordoba. Annex to Marie Curie (C-3). Campus of Rabanales. 14071-Córdoba. Spain.

qa1gohea@uco.es

Abstract Antioxidant compounds have an important role in human health owing to some benefits, such as radical scavenging properties, which can decrease the prevalence of vascular diseases or cancer. Polyphenols and ascorbic acid are among the most relevant antioxidants, being the total content of polyphenols of these compounds traditionally estimated using the Folin Ciocalteu method. However, this method is affected by the presence of ascorbic acid and other reducing substances, so an overestimation of total polyphenol content can be obtained. The method presented here is aimed at the simultaneous determination of ascorbic acid and phenolic antioxidants, using gallic acid as the model analyte.

The method developed allows the simultaneous determination of gallic acid and ascorbic acid and is based on the formation of silver nanotriangles observed by reacting silver nanoparticles of small size (10 nm), silver nitrate and citrate in the presence of the analytes. Under the experimental conditions assayed, the formation of silver nanotriangles was confirmed by the use of TEM images and UV-vis absorption spectra. Silver nanotriangles exhibit two different absorption maxima (450 and 590 nm), which allow the use of the proportional equation method to solve mixtures of ascorbic and gallic acids. A systematic study of the variables involved in the process has been performed in order to obtain additive signals to solve the equation system for binary mixtures in the μM range for both analytes.