

Colorimetric Detection of Cysteine using Silver-hydroxyapatite Nanoparticles

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Cysteine, one example of the sulphur-containing amino acid, acts as most an effective antioxidant in our body. An excessive amount of cysteine may lead to the formation of stone in kidney, bladder, ureters due to disulfide bond formed, cystine. This research presents a direct and simple way for determining cysteine in aqueous sample by observing the formation of silver nanoparticles clusters on hydroxyapatite (HAPs) induced by cysteine. The mixture of cysteine and NaBH₄ was added onto HAPs containing Ag⁺. The color of HAP changed from yellow to purple in increasing cysteine concentration. TEM was used to observe HAPs structure and the presence of silver nanoparticles cluster after adding cysteine while the intensity of material color was determined by Image-J program. TEM results showed the difference in silver nanoparticles cluster size resulted from using a low and high concentration of cysteine. The varied concentration of Ag⁺, volume of NaBH₄, and the reaction time between Ag⁺ solution and HAP was also studied. The standard calibration chart for cysteine determination was constructed from 5 to 30 μM. The method showed a potential in the application in the determination of cysteine in urine sample for clinical screening.

Keywords: Cysteine; Hydroxyapatite; Silver nanoparticle; Colorimetric detection