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A Dual Channel Optical Sensor for Norepinephrine via Situ Generated Silver Nanoparticles

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Abstract : Norepinephrine (NE) is one of the naturally occurring catecholamines which act both as a neurotransmitter and a hormone. Catecholamine levels are used for the diagnosis and regulation of phaeochromocytoma, a neuroendocrine tumor of the adrenal medulla. The development of simple, rapid and cost-effective sensors for NE still remains a great challenge. Herein, a dual-channel sensor has been developed for the determination of NE. A mixture of $AgNO_3$, NaOH, $NH_3.H_2O$ and cetrimonium bromide in appropriate concentrations was taken as the working solution. To the thoroughly vortexed mixture, an appropriate volume of NE solution was added. After a particular time, the fluorescence and absorbance were measured. Fluorescence measurements were made by exciting at a wavelength of 400 nm. A dual-channel optical sensor has been developed for the colorimetric as well as the fluorimetric determination of NE. Metal enhanced fluorescence property of nanoparticles forms the basis of the fluorimetric detection of this assay, whereas the appearance of brown color in the presence of NE leads to colorimetric detection. Wide linear ranges and sub-micromolar detection limits were obtained using both the techniques. Moreover, the colorimetric approach was applied for the determination of NE in synthetic blood serum and the results obtained were compared with the classic high-performance liquid chromatography (HPLC) method. Recoveries between 97% and 104% were obtained using the proposed method. Based on five replicate measurements, relative standard deviation (RSD) for NE determination in the examined synthetic blood serum was found to be 2.3%. This indicates the reliability of the proposed sensor for real sample analysis.

Keywords : norepinephrine, colorimetry, fluorescence, silver nanoparticles
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