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Colorimetric detection of ammonia using smartphones based on localized surface plasmon resonance of silver nanoparticles

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ABSTRACT

In this work, a rapid and straightforward method was developed for colorimetric determination of ammonia using smartphones. The mechanism is based on the manipulation of the surface plasmon band of silver nanoparticles (AgNPs) via the formation of $\text{Ag}(\text{NH}_3)_2^+$ complex. This complex decreases the amount of AgNPs in the solution and consequently, the color intensity of the colloidal system decreases. Not only the variation in color intensity of the solution can be tracked by a UV-Vis spectrophotometer, but also a smartphone can be employed to monitor the color intensity variation by RGB analysis. Ammonia, in the concentration range of $10 - 1000 \text{ mgL}^{-1}$, was successfully measured spectrophotometrically (UV-Vis spectrophotometer) and colorimetrically (RGB measurement) with the detection limit of 180 and 200 mgL^{-1} , respectively. Linear relationships were also developed for both methods. Also, the response time of the developed colorimetric sensor was around 20 seconds. Both of the

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