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A rapid and sensitive detection of glutathione using nanostructured V_2O_5 mimicking the oxidase activity as inorganic nanozyme

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Glutathione detection has been one of the important and critical line of investigations for biotechnologists in recent years. Herein, we introduce vanadium pentoxide nanosheets (V_2O_5 NS) as a novel nanozyme mimicking peroxidase reaction as a fast selective colorimetric assay for the detection and quantification of glutathione (GSH). The V_2O_5 NS have been prepared by ultrasonication assisted exfoliation of bulk V_2O_5 and characterised. The present process involves catalysis by V_2O_5 in the oxidation of pale yellow 3,3′,5,5′,-tetramethylbenzidine (TMB) to blue color with an absorption peak centered at 650 nm. On introduction of GSH, a fading in deep blue color of oxidized TMB occurs with a simultaneous decrease in absorbance intensity at 650 nm, indicating the sensitivity of V_2O_5 catalysed reaction. Also, GSH selectively inhibits this reaction with a detection limit of 10 nM. The high specificity of inhibition by GSH allows this system to be used for determination of GSH concentration in human serum samples. This method is simple, fast and cost effective and can evolve as a potential method in discriminatively detecting GSH.

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