

A simple paper-based colorimetric analytical device and fluorescent sensor for glucose detection by using N-doped carbon dots and metal oxide

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A new strategy for fluorescent and colorimetric sensing of hydrogen peroxide (H_2O_2) and glucose based on metal oxides – carbon dots composite is investigated. The sensing system relates to the catalytic oxidation reaction of glucose by glucose oxidase (GO_x) to produce H_2O_2 . Metal oxides with nitrogen-doped carbon dots (MFNCDs) with an intrinsic peroxidase-like activity are synthesized and used as a catalyst to oxidize of 3,3',5,5'-tetramethylbenzidine (TMB) in the presence of hydrogen peroxide (H_2O_2), forming a typical blue color (oxTMB) with a characteristic absorption peak at 652 nm. The fluorescence of MFNCDs/TMB can be quenched with the presence of H_2O_2 at 405 nm through inner filter effect (IFE) and electron transfer within MFNCDs, oxTMB, and glucose system. Hence, the fluorescence and absorbance intensity can be applied for the quantitative determination of the concentration of H_2O_2 and glucose. Furthermore, the colorimetric readout on the paper device based on the changing color of solution can also use to integrate with a smartphone platform to conduct an on-site analysis of glucose without using the spectrometer.