Chemiluminescent carbon nanodots as sensors for hydrogen peroxide and glucose.

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The chemical environment of the cell is very diverse and such components are very much responsible for the plethora of cellular activities. Chemicals like Hydrogen peroxide (H2O2), a product generated in the body which triggers pathophysiological and glucose metabolic disorders which holds the potential to cause lethal effects on the life. Therefore sensing such components might be a key to disease diagnostics - treatment and for the precise detection, fluorescent carbon nanodots (CDs) are considered as the most popular choice for the detection of H2O2 and glucose. However CD’s florescent properties matters a lot especially when used as chemical sensors. These efficient CDs were synthesized by citric acid, Urea ad DMF with one-pot solvothermal method whose mixtures were added to Teflon lined autoclave, and was treated with 8000 rpm min−1 centrifugal to remove the solid for 3 times, shows bright and persistent deep-red (DR) chemiluminescence (CL) in bis(2,4,6-trichlorophenyl) oxalate and H2O2 solution with a CL quantum yield of $(8.22 \pm 0.30) \times 10{-}3$, the most efficient values till date.

Complex living systems derive energy from glucose through multi step bionetgretic reactions to thrive and propagate and any minor or major contradictions in any such vital metabolic mechanisms like diabetes etc is a potential danger to human life and it is important to monitor the H2O2 levels to prevent such disorders. CDs are known for their chemical stability, tunable emissive wavelength, good low-cost and excellent bio-compatibility, have found applications in optoelectronics devices, bioimaging, photocatalysis, and many more. Such CDs surface morphology were characterized by high resolution TEM and SEM , the DLS ,adsorption spectrum, fluorescence lifetime and quantum yield were also measured using Zetasizer Nano ZS laser particle size analyzer (Malvern) and Hitachi UH-4150 UV–VIS–NIR spectrophotometer y,Horiba FL-322 using a 370 nm Nano-LED monitoring the emission at 654 nm respectively. The results shows that, the CDs exhibit broad size distribution 3.9 ± 2.6 nm of as revealed by TEM , TEM (HRTEM) suggests well-resolved lattice spacing of 0.21 nm, corresponding to the (100) crystallographic plane of graphitic carbon. Raman spectroscopy shows large intensity ratio of G to D band which makes the CDs more crystalline in nature. FTIR and XPS are employed to investigate the chemical composition and functional groups, the peaks suggests the presence of , -COOH, -OH and –NH2 groups on the surface of CDs. Further, the energy levels of CDs have been calculated and the relationship between chemiluminscence intensity and concentration of reactant are analyzed through kinetic studies. These CD s are very much suitable and shows more affinities towards H202 and glucose thus employable for detection and excels as the most competitive biosensors.