Near-Infrared Light Controlled Photocatalytic Activity of Carbon Quantum Dots for Highly Selective Oxidation Reaction

Haitao Li,[a] Ruihua Liu,[a] Suoyuan Lian,[a,b] Yang Liu,*[a] Hui Huang,[a] Zhenhui Kang*[a]

Supporting Information

1. Figures

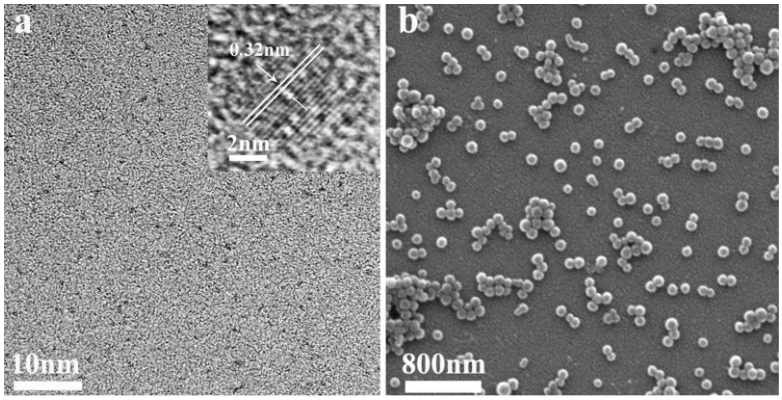


Figure S1 (a) TEM image of CQDs, inset is the HRTEM image; (b) SEM image of CNPs.

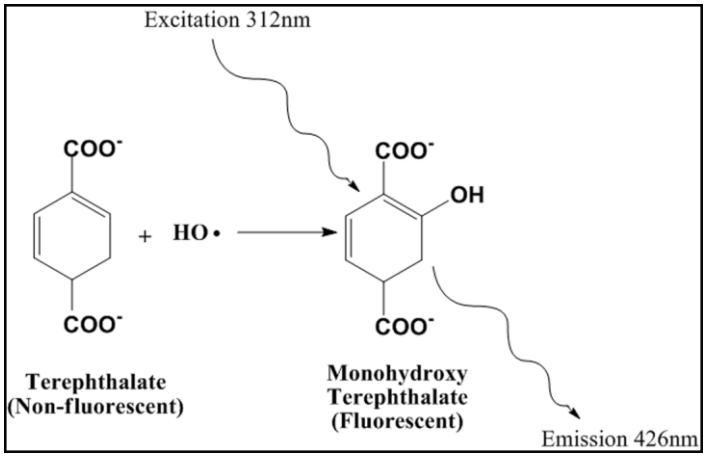


Figure S2. Reaction between hydroxyl radicals and terephthalate yielding one intensely fluorescent mono-hydroxylated isomer.

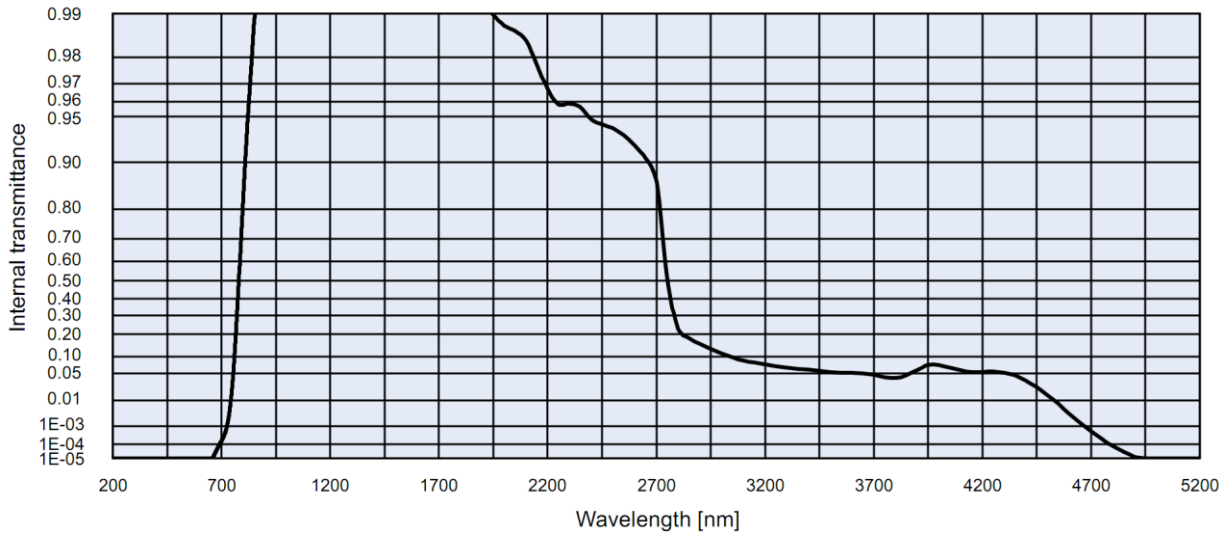


Figure S3 The wavelength distribution of light after filtered by Schott optical filter RG780.

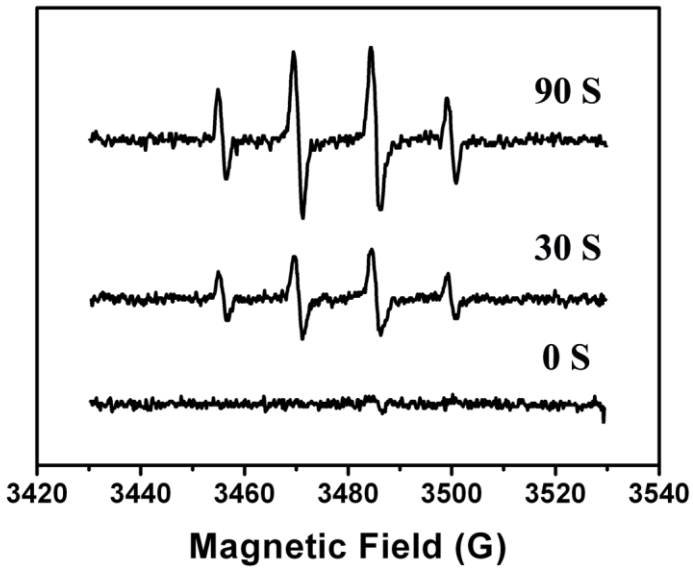


Figure S4. The ESR signals of the DMPO-•OH (aqueous solution) adducts for CQDs/H_2O_2 system under NIR light irradiation. [CQDs]=4 mg/50 mL; [H_2O_2]= 10mM; [DMPO]=40mM.

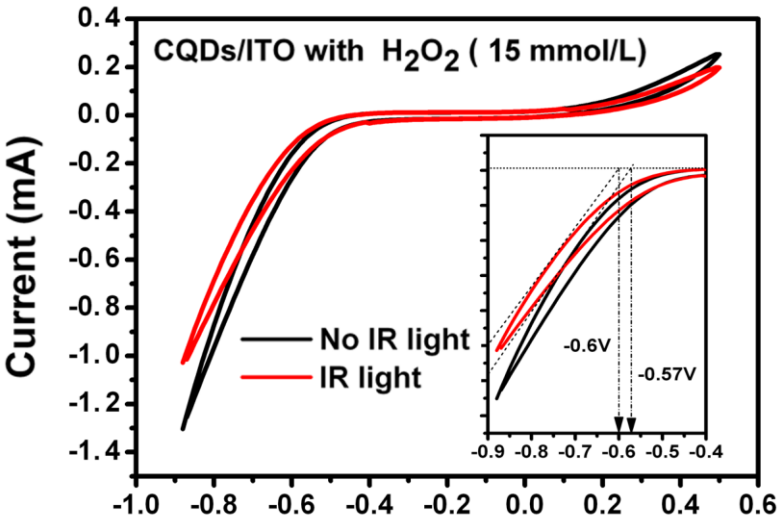
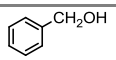
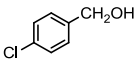
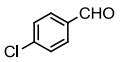
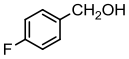
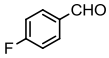
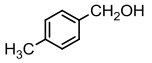
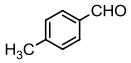
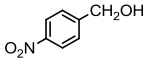
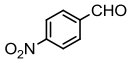
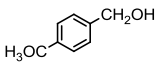
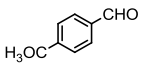
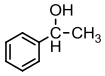
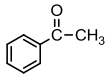
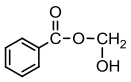
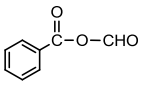


Figure S5 Cyclic voltammograms of the CQDs/ITO electrode in 0.05 M (pH 7.4) phosphate buffer and in the presence of 15 mM of H_2O_2 under NIR light irradiation or not.

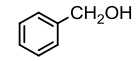
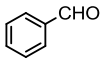
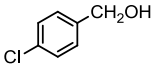
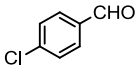
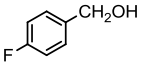
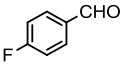
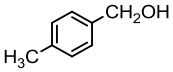
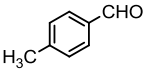
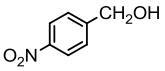
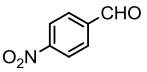
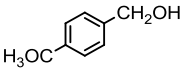
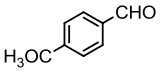
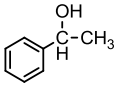
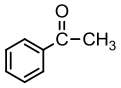
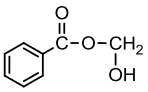
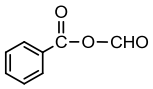
2.Table

Table S1 Selective oxidation of alcohols to aldehydes and ketones without NIR light irradiation and CQDs catalyst.[a]

Entry	Reactants	Products	Conv. [%]
1			21
2			18
3			22
4			20
5			17
6			25
7			16
8			21

[a] 10 mmol alcohol, H_2O_2 (10 mmol, 30 wt% in water), no catalyst, 60℃, 12 h without NIR light irradiation. H_2O_2 was added continuously over 12 h.

Table S2. Selective photocatalytic oxidation of benzyl alcohol and its derivatives into corresponding aldehydes in the presence of CQDs and H_2O_2 under irradiation with NIR light after three cycles.[a]

Entry	Reactants	Products	Conv. [%]	Sel. [%]
1			90	100
2			84	>99
3			89	>98
4			87	>98
5			86	>99
6			86	>99
7			87	>96
8			87	>99

[a] 10 mmol alcohol, H_2O_2 (10 mmol, 30 wt% in water), 8 mg CQDs catalyst, 60℃, followed by NIR irradiation for 12 h. H_2O_2 was added continuously over 12 h.