Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Fluorescence Alarming ON-OFF-ON Switch Derived from Biocompatible Carbon Nanoparticle-Hemoglobin-H2O2 Interaction

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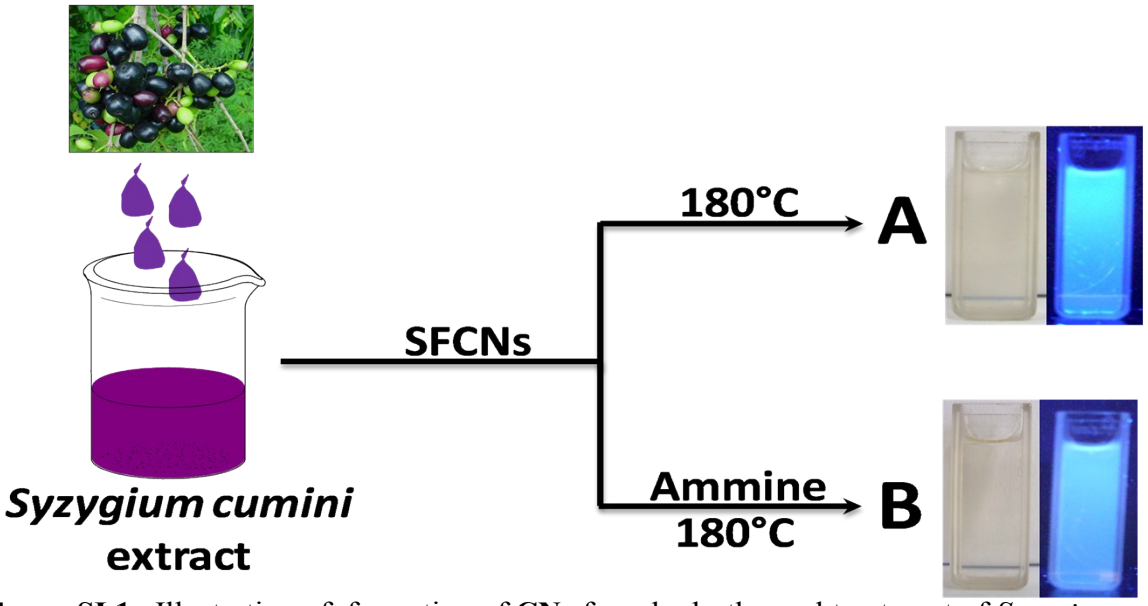


Scheme SI 1. Illustration of formation of **CNs** from hydrothermal treatment of *Syzygium cumini* extract.

Biosensing

CNs-A

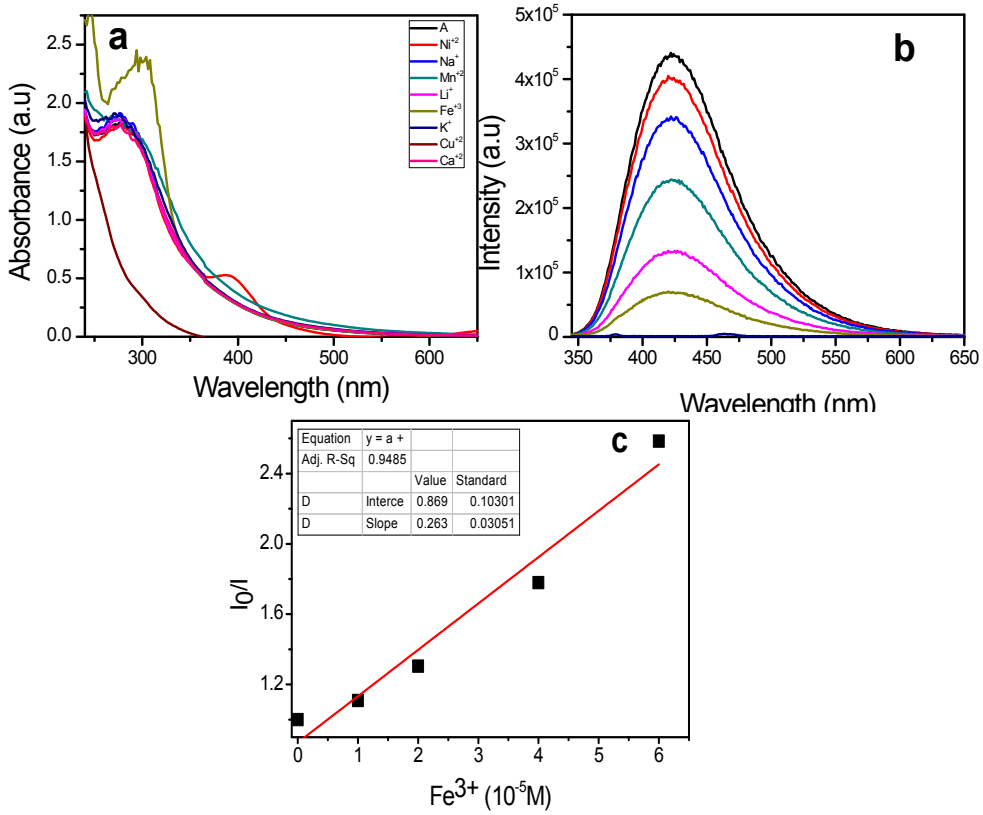


Figure SI 1. (a) The Optical response of **CNs-A** in the presence of different cations (b) Typical PL quenching of **CNs-A** in different concentrations of Fe^{3+} (a–g): 0, 1, 2, 4, 6, 8, 10 (μM). (c) Linear relationship between I_0/I and Fe^{3+} concentration in the range of 0–6 (μM).

CNs-B

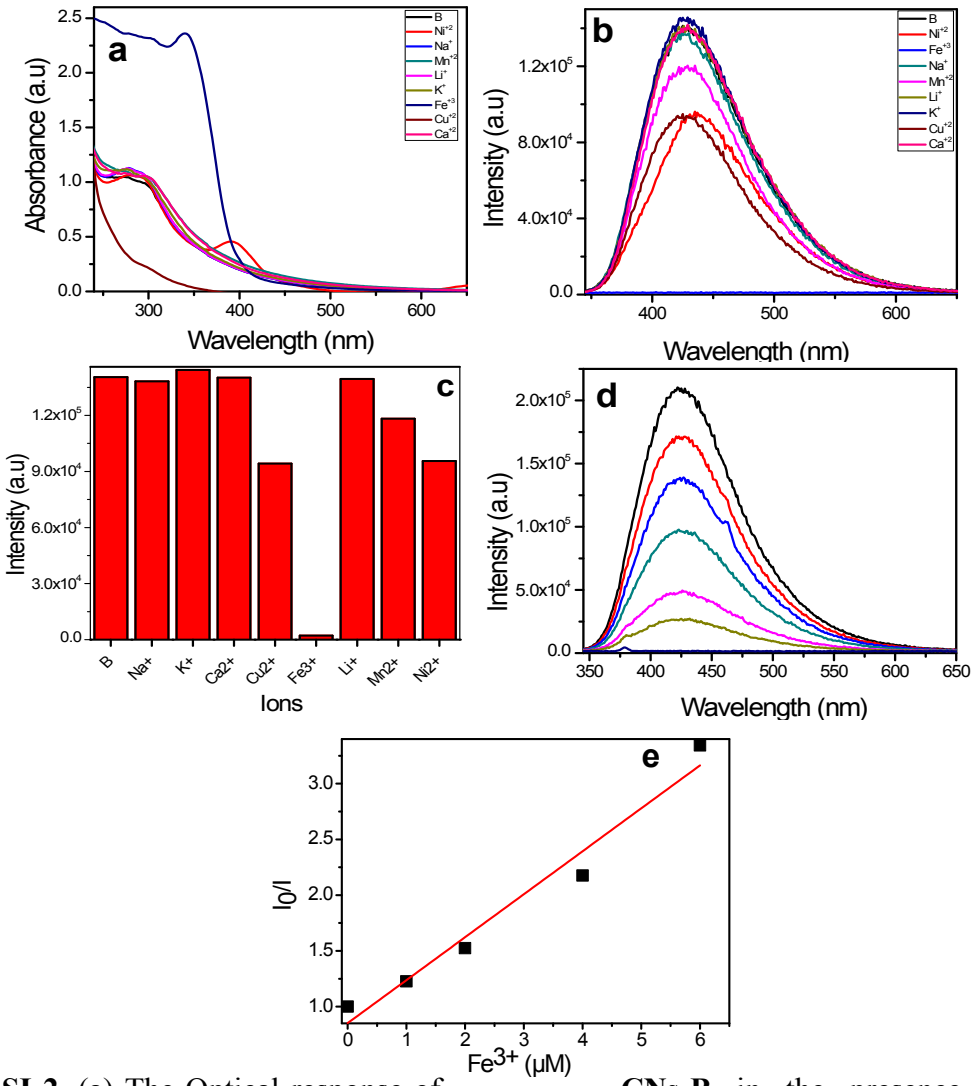


Figure SI 2. (a) The Optical response of **CNs-B** in the presence of different cations (b) Fluorescence response of **CNs-B** in the presence of different cations, (c) Performance of **CNs-B** : comparison of fluorescence intensities in presence of different metal ions. (d) Typical PL quenching of **CNs-B** in different concentrations of Fe^{3+} (a–g): 0, 1, 2, 4, 6, 8, 10 (μM). (e) Linear relationship between I_0/I and Hb concentration in the range of 0–6 (μM).

Table SI 1 : K_{sv} and Correlation Coefficient for **CNs- A and B**.

Samples	K_{sv} ($\times 10^4$) L mol^{-1}	Intercept	Standard Error (%)	Correlation Coefficient
A+Fe^{3+}	2.63	0.86	3.0	0.94
B+Fe^{3+}	3.86	0.85	3.9	0.95

CNs-B

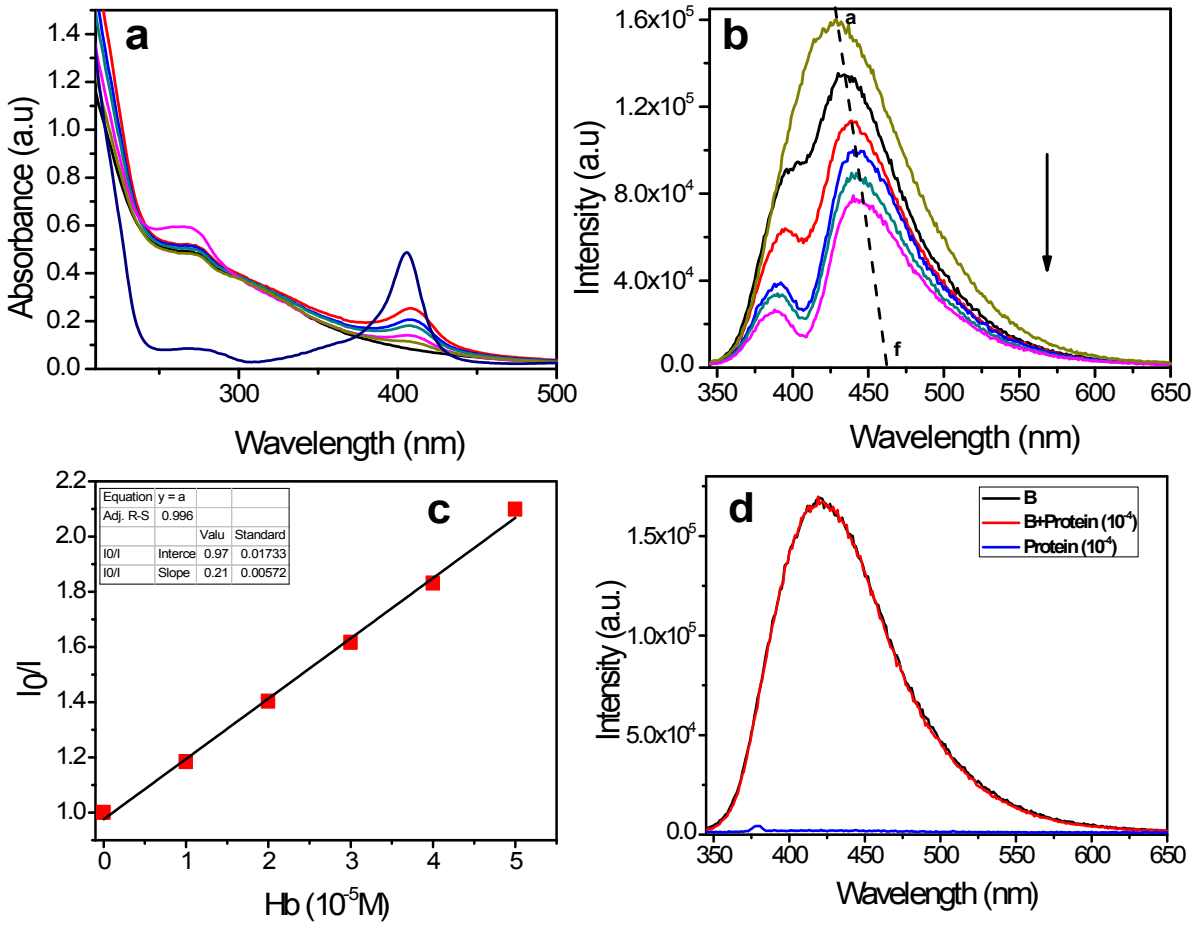


Figure SI 3. (a) The Optical response of **CNs-B** in the presence of different concentration of Hb (a–g): 0-5(μM). (b) Typical PL quenching of **CNs-B** in different concentrations of Hb (a–g): 0-5(μM). (c). Linear relationship between I_0/I and Hb concentration in the range of 0–5 (μM). (d) Fluorescence response of **CNs** in the absence and presence of Protein (Bovin albumin serum).

Table SI 2 : K_{sv} and Correlation Coefficient for **CNs-A and B**.

Samples	K_{sv} ($\times 10^4$) L mol^{-1}	Intercept	Standard Error (%)	Correlation Coefficient
A+Hb	2.99	0.94	1.38	0.98
B+Hb	2.18	0.97	0.57	0.99

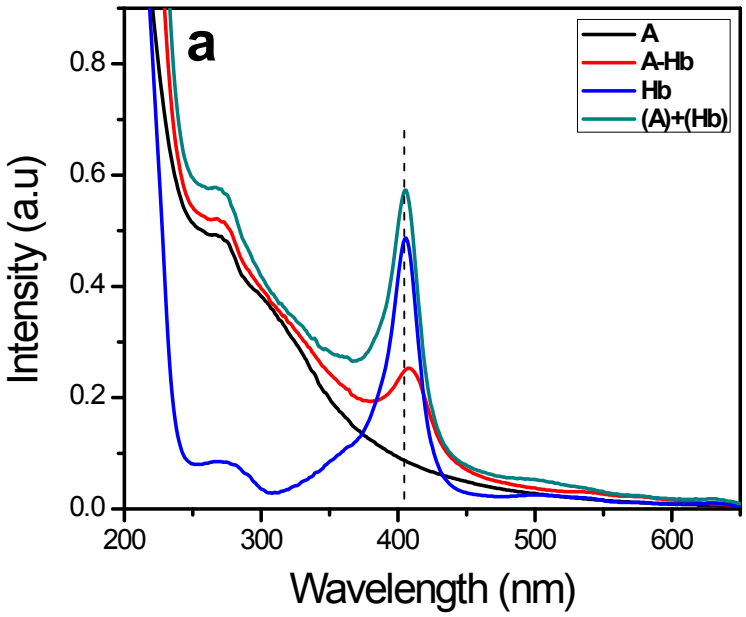
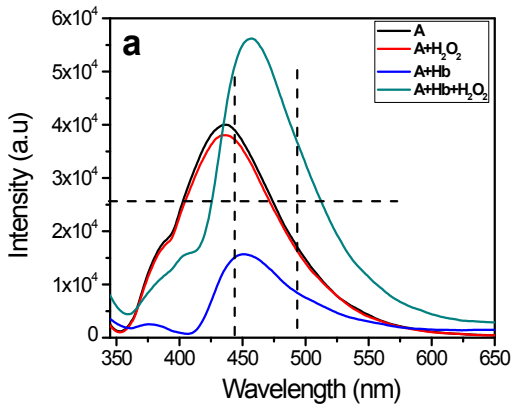
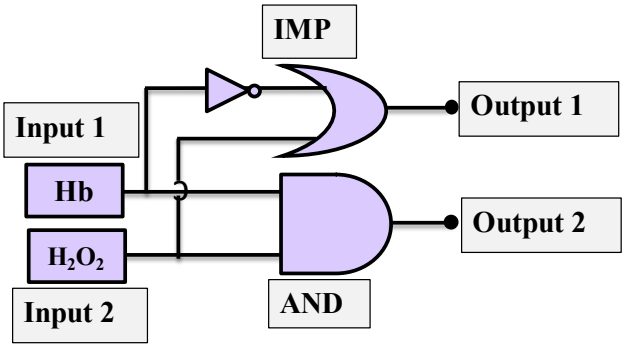


Figure SI 4. (a) UV–vis absorption spectra of **CNs-A**, Hb and **CNs-A -Hb** composite system, the sum of individual absorption spectrum of **CNs- A** and Hb respectively.



Input 1 (Hb)	Input 2 (H_2O_2)	Output 1 (IMP) I_{443nm}	Output 2 (AND) A_{493nm}
0	0	1	0
1	0	0	0
0	1	1	0
1	1	1	1

b



c

Figure SI 5. (a) Emission Spectra of **CNs-B** under different input condition Hb and H_2O_2 with a horizontal line (dashed) that marks the threshold value **(controlled pH 7.4)**. (b) The truth table.(c) The Combinatorial logic scheme. (**controlled pH 7.4**).

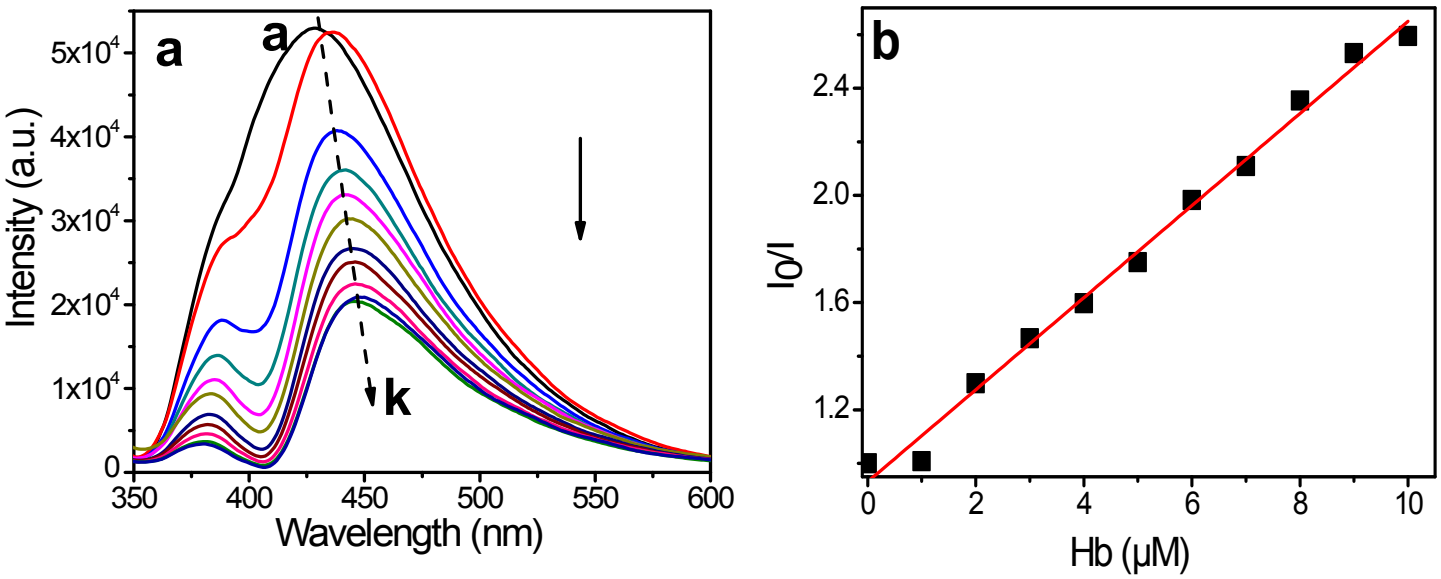


Figure SI 6. (a) Typical PL quenching of **CNs-B** in different concentrations of Hb (a–k): 0-10 (μM). (b). Linear relationship between I_0/I and Hb concentration in the range of 0–10 (μM) Hb concentration in the range of 0–10 (μM) under controlled pH 7.4

Table SI 3 : K_{sv} and Correlation Coefficient for **CNs-A and B** in presence of buffer pH7.4

Samples	K_{sv} ($\times 10^4$) L mol^{-1}	Intercept	Standard Error (%)	Correlation Coefficient
A+Hb	1.54	0.94	0.34	0.99
B+Hb	1.71	0.93	0.57	0.99

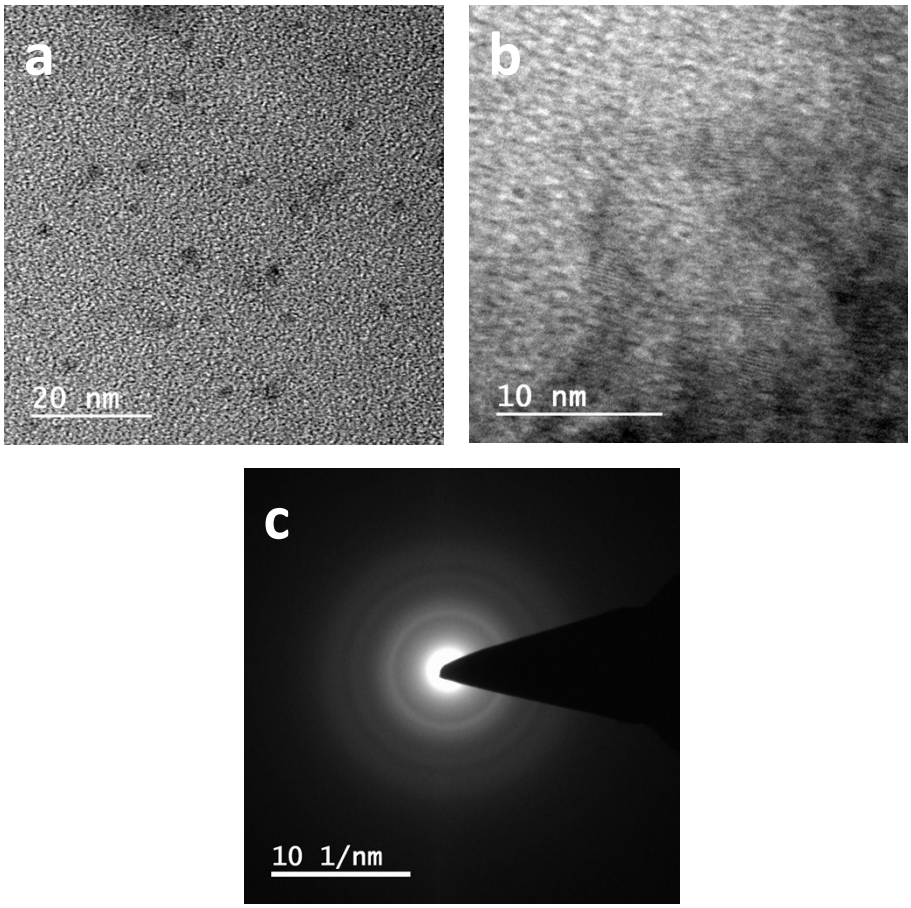


Figure SI 7. (a) TEM image of **CNs-A** on addition of H_2O_2 with scale bar 50nm. (b) HRTEM image showing the existence of crystalline parts with scale bar 10 nm (c) SAED pattern of the **CNs-A** with H_2O_2.