Supporting Information

The Silicon-hybrid Carbon Dot Derived from Rice Husk: A promising fluorescent probe for trivalent rare earth element ions in aqueous media

Xu Chu[b], Yan Cao[a,b,c,d]

[a] Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences, Wushan, Guangzhou 510640, China
[b] College of Chemistry and Chemical Engineering, Anhui University, Hefei, 230601, China
[c] CAS Key Laboratory of Renewable Energy, Guangzhou 510640, China
[d] Guangdong Provincial Key Laboratory of New and Renewable Energy Research and Development, Guangzhou 510640, China

(Corresponding author E-mail: caoyan@ms.giec.ac.cn)

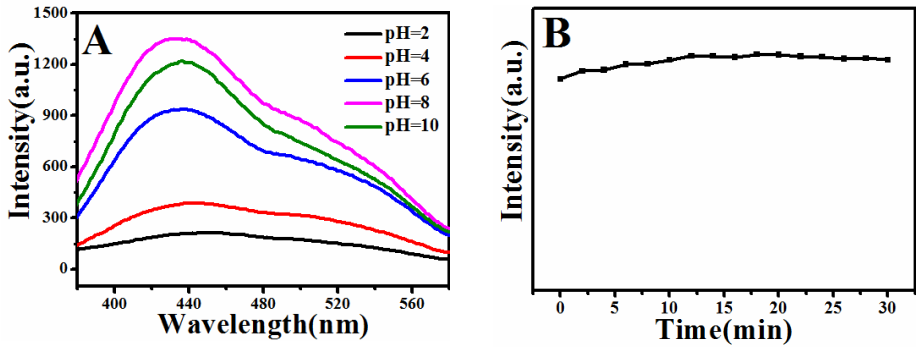

Figure S1 Fluorescence spectra of the as-prepared Si-CD solution in different pH (A) values and time (B).

To obtain the optimal analytical conditions for the as-prepared Si-CD-Tb system, experimental variables affecting the whole sensing process were studied, such as excitation wavelength, concentration of as-prepared Si-CD, and pH. The effect of excitation wavelength was researched in the range of excitation wavelength from 300 to 340 nm (Figure S2A). The result showed that the excitation wavelength at 300 nm was optimal for further research. The effect of the as-prepared Si-CD concentration on the fluorescence intensity of the system was investigated in the range of 0.01-0.05 mg mL^{-1} with constant concentration of Tb^{3+}. As shown in Figure S1B, the optimum concentration of the as-prepared Si-CD (0.05 mg mL^{-1}) was used in the present work. The effect of solution pH on the fluorescence intensity of the Si-CD system was studied in the range from 2.0 to 10.0 (Figure S2C). The result indicated that fluorescence intensity of Si-CD-Tb system increased with increase in pH from 4.0 to 8.0. Finally, deionized water (pH= 6-8) was chosen for further study in order to reduce impact variables.

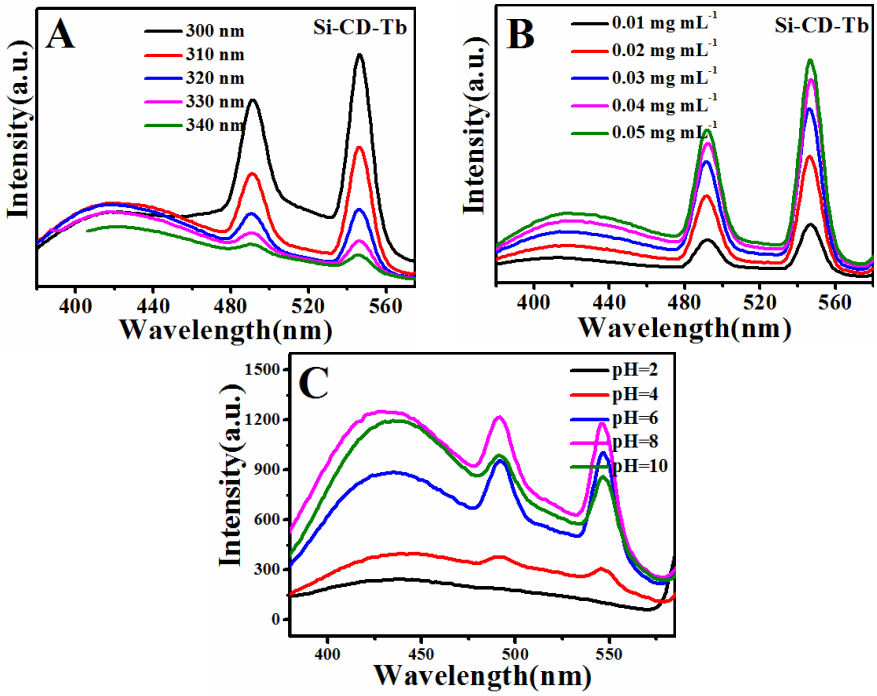

Figure S2 (A) Influence of excitation wavelength on the fluorescence spectra the as-prepared Si-CD-Tb (10 μM) system. (B) Influence of concentration of Si-CD on the fluorescence spectra the as-prepared Si-CD-Tb system (10 μM). (C) Influence of pH on the fluorescence spectra the as-prepared Si-CD-Tb system (1 μM).

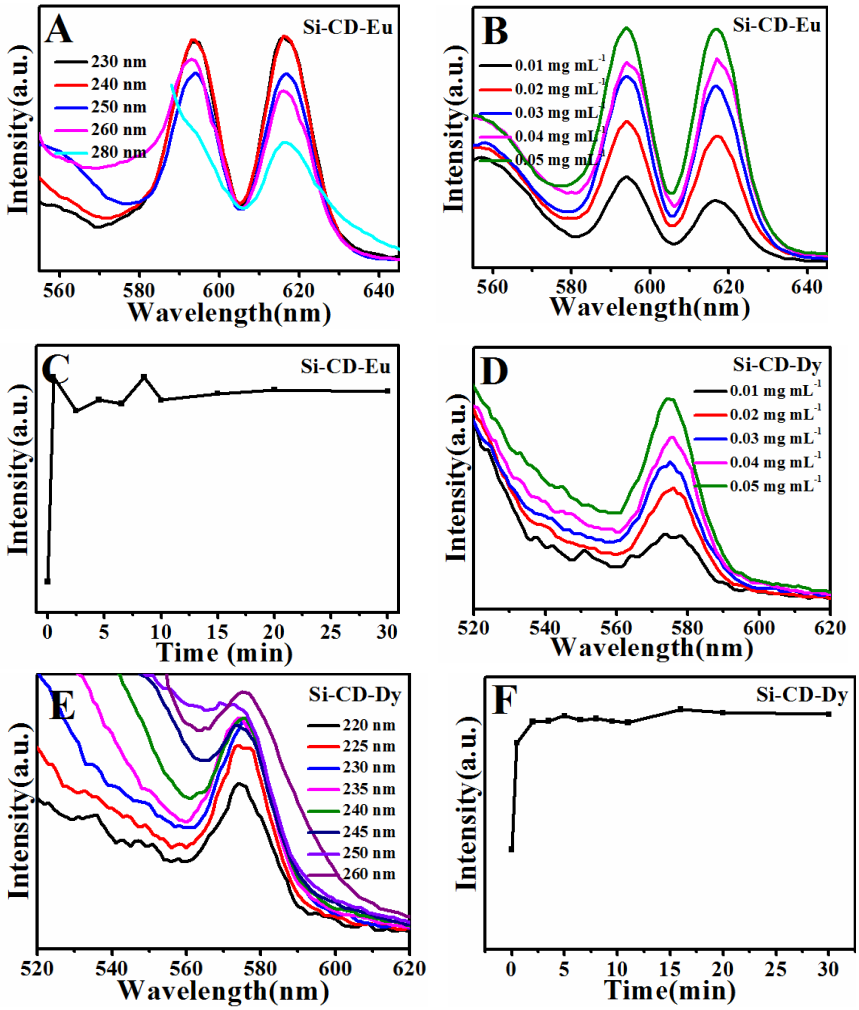

Figure S3 (A), (B), (C), (D), (E) and (F) Influence of excitation wavelength, concentration of Si-CD and response time on the fluorescence intensity of the Si-CD-Eu/Dy system

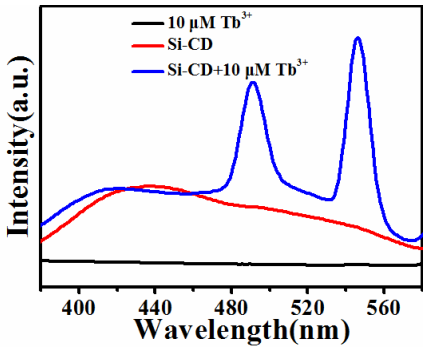

Figure S4 Fluorescence spectra of Tb^{3+}, Si-CD and Si-CD-Tb solutions

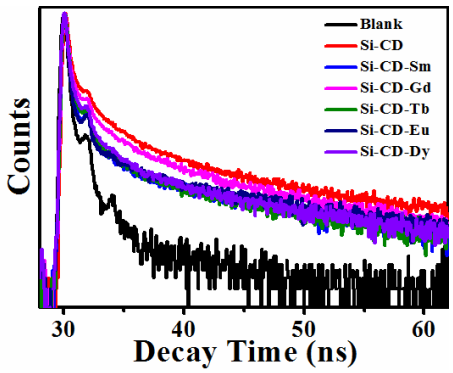

Figure S5 The fluorescence lifetime decay curves of Si-CD (0.05 mg mL^{-1}) in the absence or presence of 100 μM REEs (Sm^{3+}, Gd^{3+}, Tb^{3+}, Eu^{3+} and Dy^{3+}) ($\lambda_{ex}/\lambda_{em}$=373 nm/434 nm)

Table S1 The fluorescence lifetimes of Si-CD and Si-CD-REE

sample	τ_1(ns)	Rel.%	τ_2(ns)	Rel.%	τ_{ave}(ns)
Si-CD	0.27	57.91	3.2	42.08	1.50
Si-CD-Sm	0.24	100	-	-	0.24
Si-CD-Gd	0.26	0.664	3.78	0.336	1.44
Si-CD-Tb	0.26	100	-	-	0.26
Si-CD-Eu	0.26	100	-	-	0.26
Si-CD-Dy	0.25	100	-	-	0.25