

## Electronic Supplementary Information (ESI)

### **Metal ion-induced chemiluminescence recovery for highly intensive chemiluminescence bifunctionalized polydopamine nanospheres**

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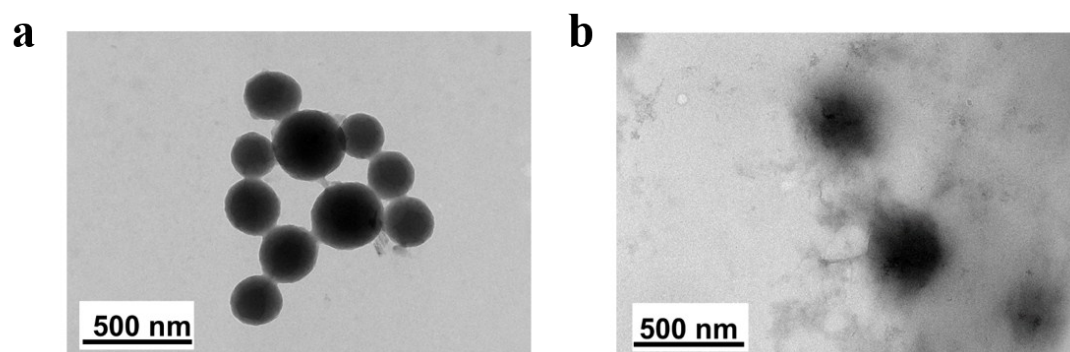
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## Table of Contents

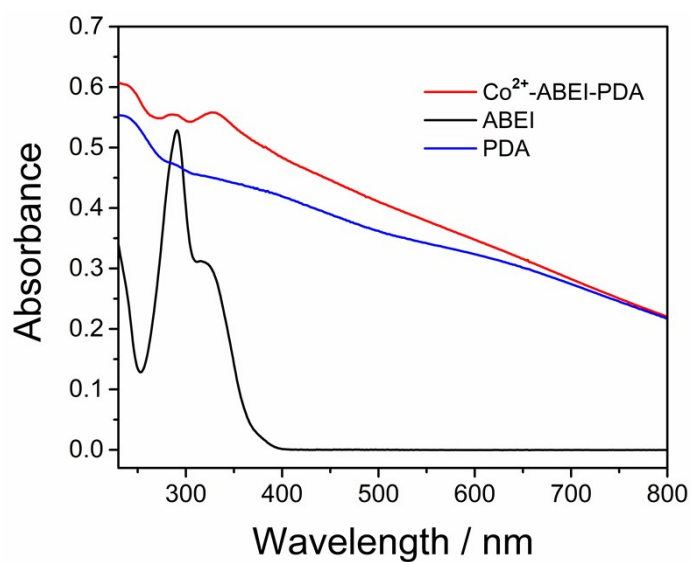
1. TEM images of PDA and Co <sup>2+</sup> -ABEI-PDA nanospheres.....	S3
2. UV-visible absorption spectra of ABEI, PDA and Co <sup>2+</sup> -ABEI-PDA nanospheres.....	S4
3. FT-IR spectra of PDA and Co <sup>2+</sup> -ABEI-PDA nanospheres.....	S5
4. Effect of Co <sup>2+</sup> concentration, H <sub>2</sub> O <sub>2</sub> concentration and pH of H <sub>2</sub> O <sub>2</sub> on CL performance.....	S6
5. Stability of Co <sup>2+</sup> -ABEI-PDA nanospheres.....	S7
6. Loading amount of Co <sup>2+</sup> and ABEI in Co <sup>2+</sup> -ABEI-PDA nanospheres and ABEI/Co <sup>2+</sup> -CaCO <sub>3</sub> microspheres.....	S8

## 1. TEM images of PDA and Co<sup>2+</sup>-ABEI-PDA nanospheres



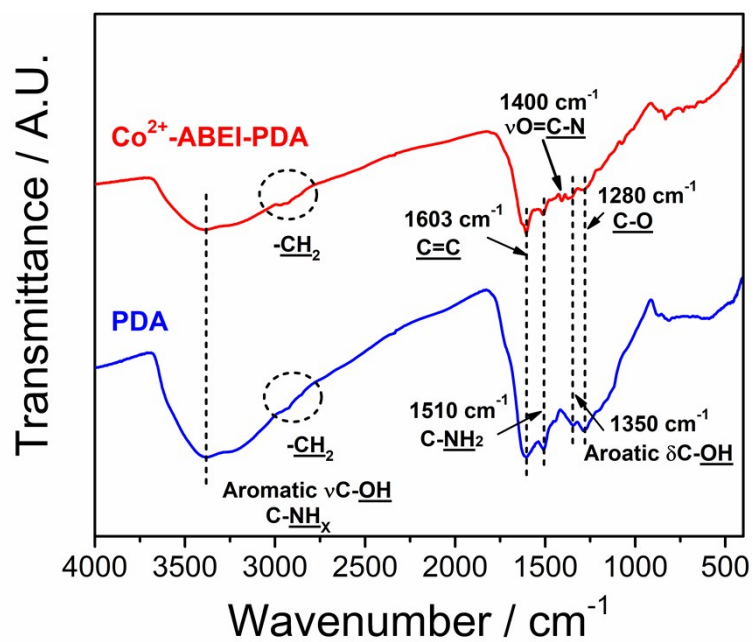
**Figure S1.** TEM images of (a) PDA nanospheres; (b) Co<sup>2+</sup>-ABEI-PDA nanospheres, wherein the pH of ABEI solution is 13.0.

## 2. UV-visible absorption spectra of ABEI, PDA and Co<sup>2+</sup>-ABEI-PDA nanospheres



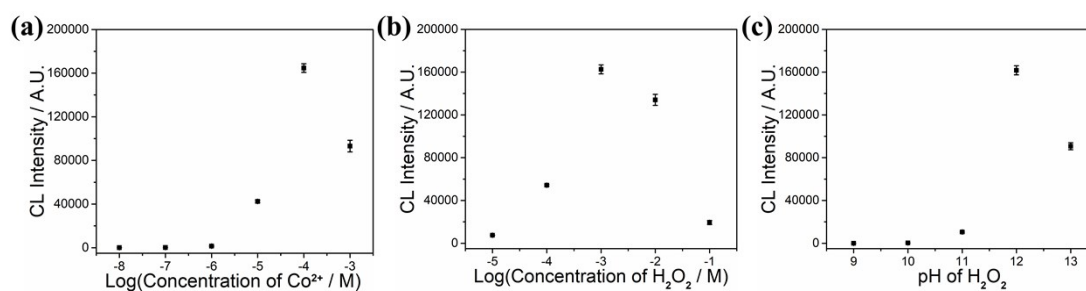
**Figure S2.** UV-visible absorption spectra of ABEI (black curve), PDA nanospheres (blue curve), and Co<sup>2+</sup>-ABEI-PDA nanospheres (red curve).

### 3. FT-IR spectra of PDA and Co<sup>2+</sup>-ABEI-PDA nanospheres



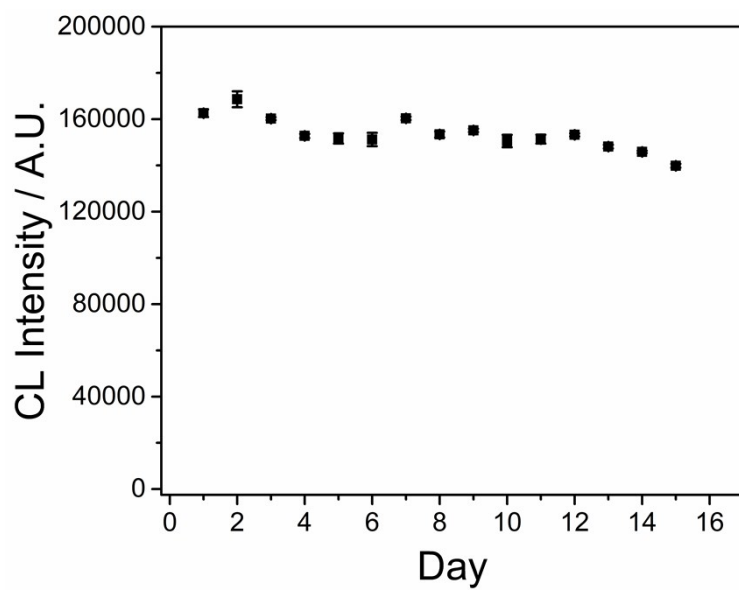
**Figure S3.** FT-IR spectra of PDA nanospheres (blue curve) and Co<sup>2+</sup>-ABEI-PDA nanospheres (red curve).

#### 4. Effect of $\text{Co}^{2+}$ concentration, $\text{H}_2\text{O}_2$ concentration and pH of $\text{H}_2\text{O}_2$ on CL performance



**Figure S4.** (a) Effect of  $\text{Co}^{2+}$  concentration on CL emission. CL kinetic curves of  $\text{Co}^{2+}$ -ABEI-PDA nanospheres at different concentrations of  $\text{Co}^{2+}$  from  $1.0 \times 10^{-8}$  to  $1.0 \times 10^{-3}$  M with  $\text{H}_2\text{O}_2$ ; (b) Optimization of  $\text{H}_2\text{O}_2$  concentration. CL kinetic curves for reaction of  $\text{Co}^{2+}$ -ABEI-PDA nanospheres with different concentrations of  $\text{H}_2\text{O}_2$  from  $1.0 \times 10^{-5}$  to  $1.0 \times 10^{-1}$  M; (c) The effect of pH of  $\text{H}_2\text{O}_2$  detection solution on the CL intensity of  $\text{Co}^{2+}$ -ABEI-PDA nanospheres with  $\text{H}_2\text{O}_2$  under different pH, wherein  $\text{H}_2\text{O}_2$  are in B-R buffer (pH=9-11) or NaOH solution (pH=12.0, 13.0), respectively.

## 5. Stability of Co<sup>2+</sup>-ABEI-PDA nanospheres



**Fig. S5** Stability of Co<sup>2+</sup>-ABEI-PDA nanospheres. Daily CL measurements of Co<sup>2+</sup>-ABEI-PDA nanospheres in 15 days.

**6. Supplementary Table 1 | Loading amount of Co<sup>2+</sup> and ABEI in Co<sup>2+</sup>-ABEI-PDA nanospheres and ABEI/Co<sup>2+</sup>-CaCO<sub>3</sub> microspheres.**

<b>Material</b>	<b>Co<sup>2+</sup> concentration</b>	<b>ABEI concentration</b>	<b>Molar ratio of Co<sup>2+</sup> and ABEI</b>
<b>Co<sup>2+</sup>-ABEI-PDA</b>	9.44 nM	122 nM	$7.74 \times 10^{-2} : 1$
<b>ABEI/Co<sup>2+</sup>-CaCO<sub>3</sub></b>	1.33 nM	2850 nM	$4.67 \times 10^{-4} : 1$

Loading amounts of ABEI in Co<sup>2+</sup>-ABEI-PDA nanospheres was determined by UV-vis analysis, and the amount of Co<sup>2+</sup> was determined by ICP-AES elemental analysis. The ABEI concentration in the supernatant was determined by measuring the absorbance at 290 nm. The as-prepared Co<sup>2+</sup>-ABEI-PDA nanospheres were purified by centrifugation for three times. The ABEI concentration in the first and second supernatant was 0.858 and 0.0198 mM, respectively, and was almost undetectable in the third time, indicating sufficient purification. Since the ABEI concentration of the start solution was 1 mM. Thus, the loading amount of ABEI in Co<sup>2+</sup>-ABEI-PDA nanospheres was calculated to be around 0.122 mM. In addition, the ICP-AES elemental analysis confirmed the existence of Co, and the amount of Co<sup>2+</sup> was determined to be 0.556 mg/mL.