

Supporting information

Solution-free, *in situ* preparation of nano/micro CuO/ZnO in dielectric barrier discharge for sensitive cataluminescence sensing of acetic acid

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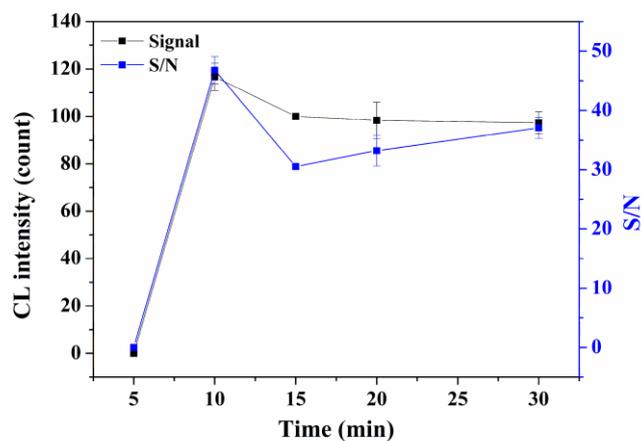


Figure S1. Optimization of the time of reaction for the DBD synthesis. Voltage: 150 V; flow rate of carrier gas: 600 mL min⁻¹; concentration of acetic acid: 120 mg L⁻¹; CTL temperature: 295 °C; flow rate of carrier gas for CTL: 600 mL min⁻¹; and wavelength: 440 nm.

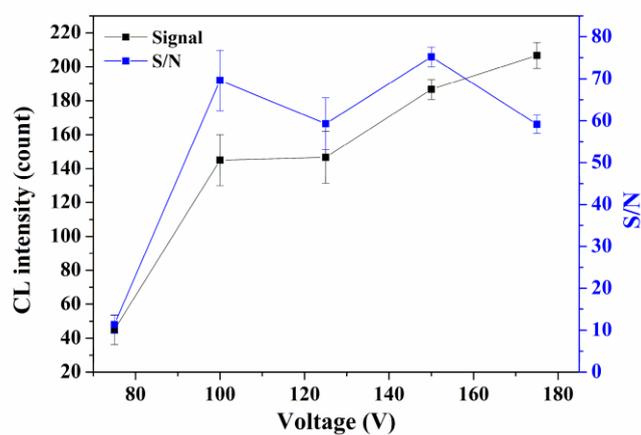


Figure S2. Optimization of the voltage of reaction for the DBD synthesis. Time of reaction: 10 min; flow rate of carrier gas: 600 mL min⁻¹; concentration of acetic acid: 120 mg L⁻¹; CTL temperature: 295 °C; flow rate of carrier gas for CTL: 600 mL min⁻¹; and wavelength: 440 nm.

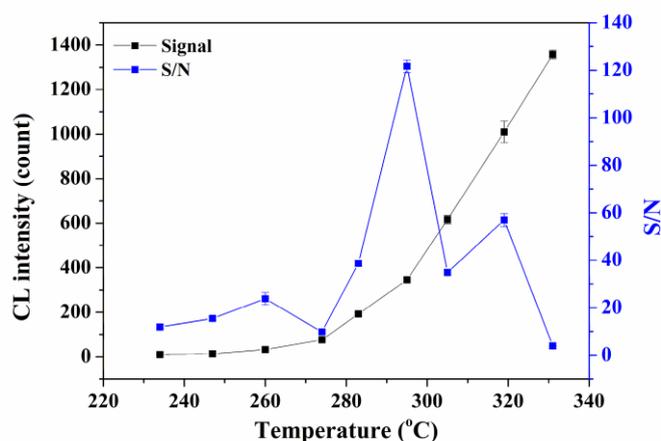


Figure S3. Optimization of temperature for CTL. (a) DBD synthesis conditions: time of reaction, 10 min; voltage, 150 V; and flow rate of carrier gas, 600 mL min⁻¹. (b) concentration of acetic acid: 120 mg L⁻¹; flow rate of carrier gas for CTL: 1000 mL min⁻¹; and wavelength: 440 nm.

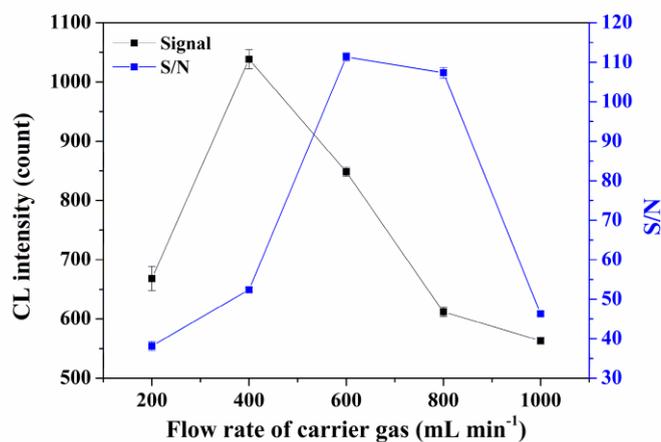


Figure S4. Optimization of flow rate of carrier gas for CTL. (a) DBD synthesis conditions: time of reaction, 10 min; voltage, 150 V; and flow rate of carrier gas, 600 mL min⁻¹. (b) concentration of acetic acid: 120 mg L⁻¹; CTL temperature: 295 °C; and wavelength: 440 nm.

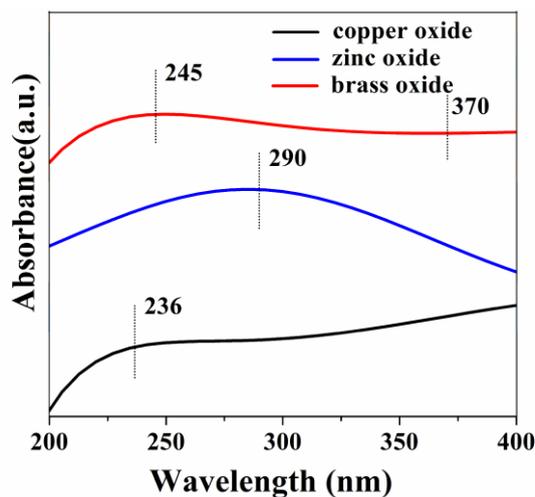


Figure S5. UV/Vis diffuse reflectance spectra (DRS) of CuO, ZnO and brass oxides.

The UV/Vis DRS are shown in Figure S5. For the brass oxides sample, two absorption bands at around 245 and 370 nm are observed, thus indicating that the states of Cu^{2+} and Zn^{2+} species in the brass oxides sample are basically consistent with those in CuO and ZnO samples, noticeably, the absorption band at around 236 nm (observed over CuO) red-shifted to 245 nm, which might be due to the interaction between Cu^{2+} and Zn^{2+} ions. Similar results have also been reported by Li et al.^[s1] when they discussed the formation of Cu-O-Mn. The UV/Vis result suggested that the interaction of Cu and Zn species on the brass surface could occur through the formation of a Cu-O-Zn composites.

[s1] D. Li, Q. Yu, S.-S. Li, H.-Q. Wan, L.-J. Liu, L. Qi, B. Liu, F. Gao, L. Dong, Y. Chen, *Chem.-Eur. J.* **2011**, *17*, 5668.

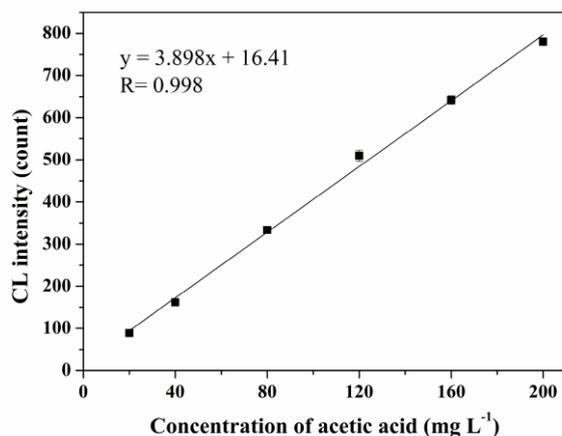


Figure S6. The calibration curve for acetic acid. (a) DBD synthesis conditions: time of reaction, 10 min; voltage, 150 V; and flow rate of carrier gas, 600 mL min⁻¹. (b) Sampling volume: 6 μL ; CTL temperature: 295 °C; flow rate of carrier gas for the CTL: 600 mL min⁻¹; and wavelength: 440 nm.

The linear regression equation is described as $Y = 3.898X + 16.41$ ($r=0.998$), where Y is the relative CTL intensity, X is the concentration of acetic acid and r is the linear regression coefficient. The limit of detection (LOD) based on $3N/S$ (N refers to the noise and S refers to the slope of the calibration curve) is 3 mg L^{-1} .

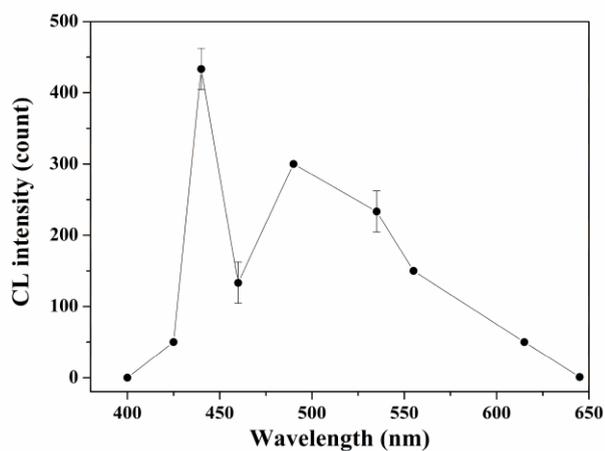


Figure S7. The CTL spectra on CuO/ZnO materials. (a) DBD synthesis conditions: time of reaction, 10 min; voltage, 150 V; and flow rate of carrier gas, 600 mL min⁻¹. (b) Sampling volume: 6 μL ; CTL temperature: 295 °C; and flow rate of carrier gas for the CTL: 600 mL min⁻¹.