A Ratiometric Naphthalimide-Based Fluorescent Chemosensor via Excimer-Monomer Switching for the Sensitive Detection of Copper(II) Ions

Characterization of BNDA

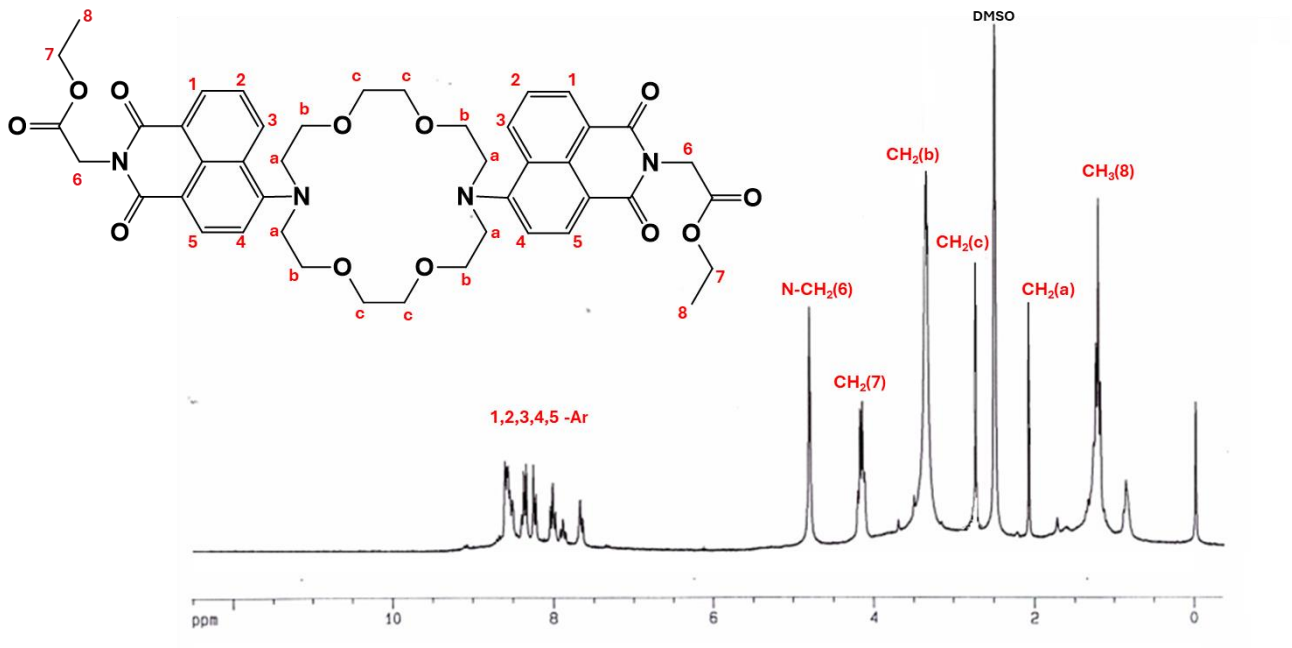

Figure S1: ^{1}HNMR.

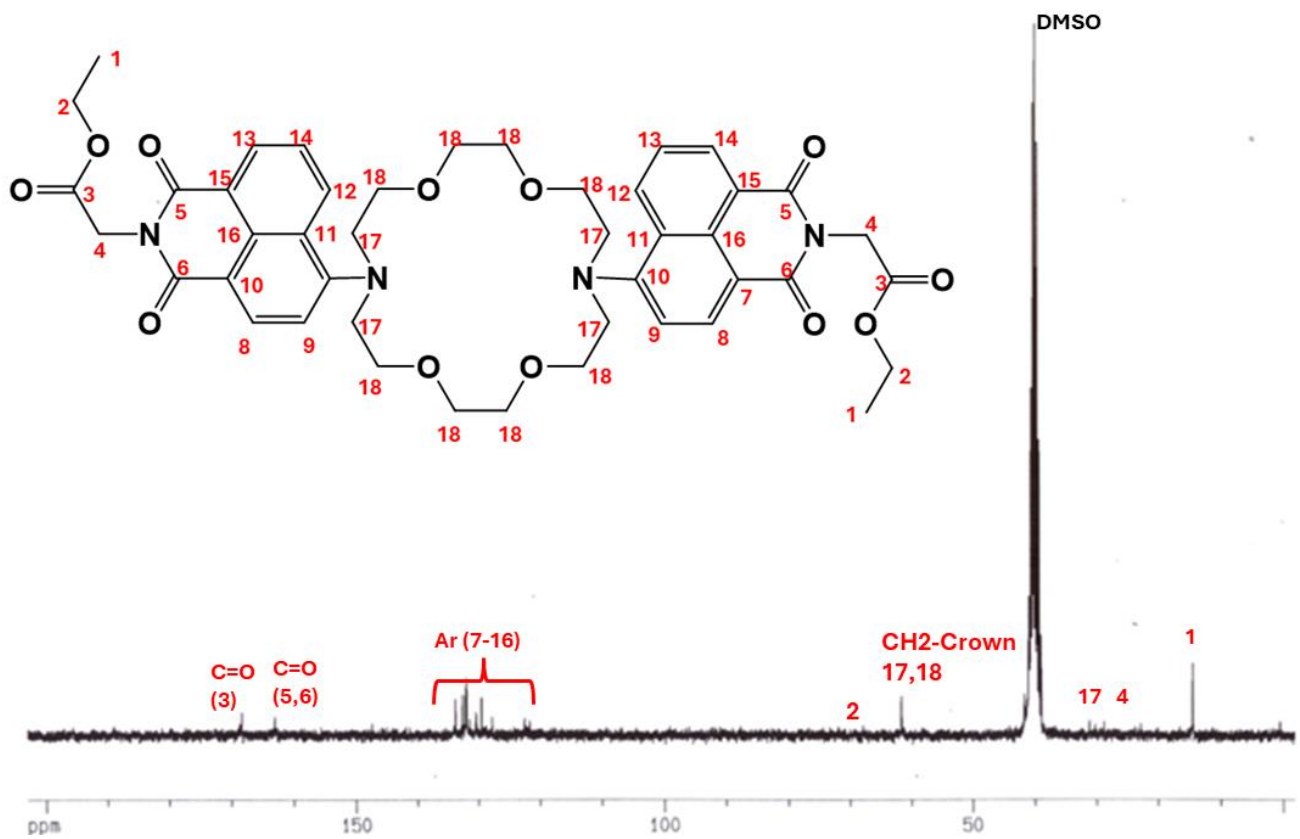

Figure S2: ^{13}CNMR.

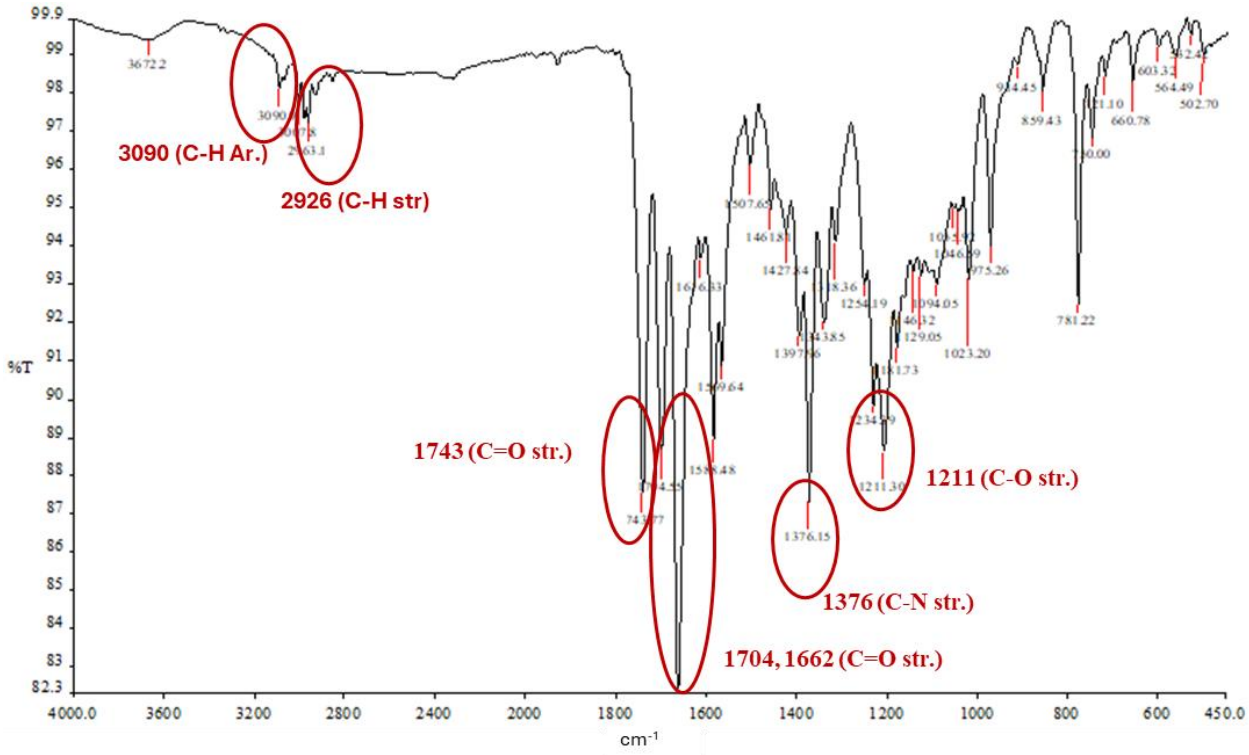

Figure S3: FTIR.

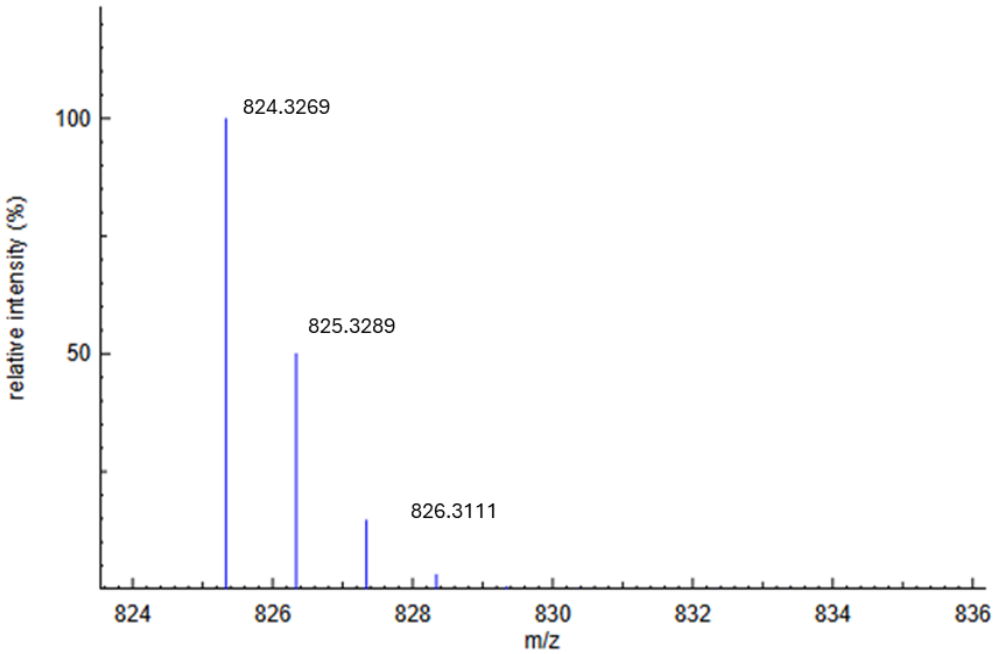

Figure S4: Mass spectra

Table S5: Elemental analysis.

$C_{16}H_{14}NO_4Br$	C %	H %	N %
Theoretical composition	52.57	3.85	3.85
Found-run1	53.11	3.76	3.91
Found-run2	52.81	3.91	3.75
Found-run3	52.78	3.68	3.79
Standard Deviation	0.1824	0.1167	0.0833
RSD %	0.35	3.09	2.18
Average	52.90	3.78	3.81

$C_{44}H_{48}N_4O_{12}$	C%	H %	N %
Theoretical composition	64.08	5.82	6.80
Found-run1	64.15	6.01	7.10
Found-run2	64.05	5.89	6.89
Found-run3	64.13	5.78	6.77
Standard Deviation	0.0529	0.1150	0.1670
RSD %	0.08	1.95	2.41
Average	64.11	5.89	6.92

Determination of stoichiometry of the complexation of Cu^{2+} with BNDA

Job's plot

The stoichiometry of the complexation of Cu^{2+} with BNDA was determined using the method of continuous variations (Job's method). Job's plot obtained by recording the variation in fluorescence intensity (λex=391 nm) at 479 nm for at a total molar concentration of 1.0 μM. Fig.S6 showed maximum near 0.5 which can be attributed to the existence of 1:1 BNDA:Cu^{2+}.

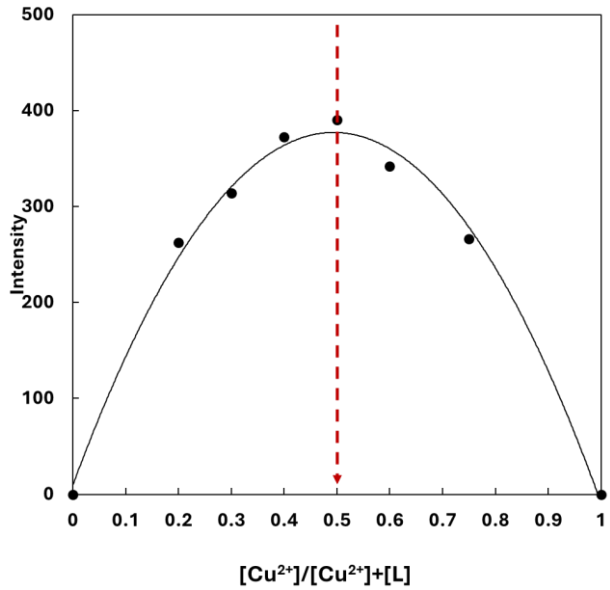

Figure S6: Job's Plot.

Binding constant calculation

Fluorescence emission studies were used to assess the binding affinity of BNDA with Cu^{2+}. Fluorescence emission spectra were recorded for BNDA as the concentration of Cu^{2+} ions were gradually increased in **BNDA.** The binding constant (K_b) for the BNDA-Cu interaction was determined via Benesi–Hildebrand equation as follows:

$$\frac{1}{I - I_0} = \frac{1}{K_b(I_{max} - I_0)[Cu^{2+}]} + \frac{1}{(I_{max} - I_0)}$$

Herein, I_0, I, and I_{max} are the emission intensities of BNDA in the absence, presence, and at a concentration of complete interaction, of Cu^{2+} ion, respectively. The binding constant K_b of BNDA-Cu was evaluated to be 5.57×10^6 M^{-1}.

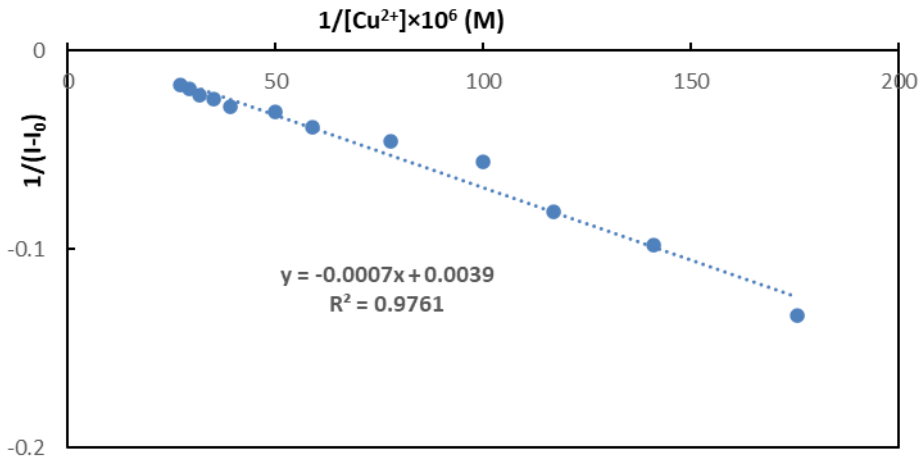

Figure S7: Benesi–Hildebrand plot analysis of Cu^{2+} with BNDA from Fluorescence spectroscopy.

Response time

The response time is defined as the time required for 95 % of the total signal change. It shows a typical response for the transition process because of change in the copper ion concentration. It should be noted that the signals leveled off after equilibrium and no drift in the response time was observed. As can be seen the response time of the sensor was measured as 30 seconds.

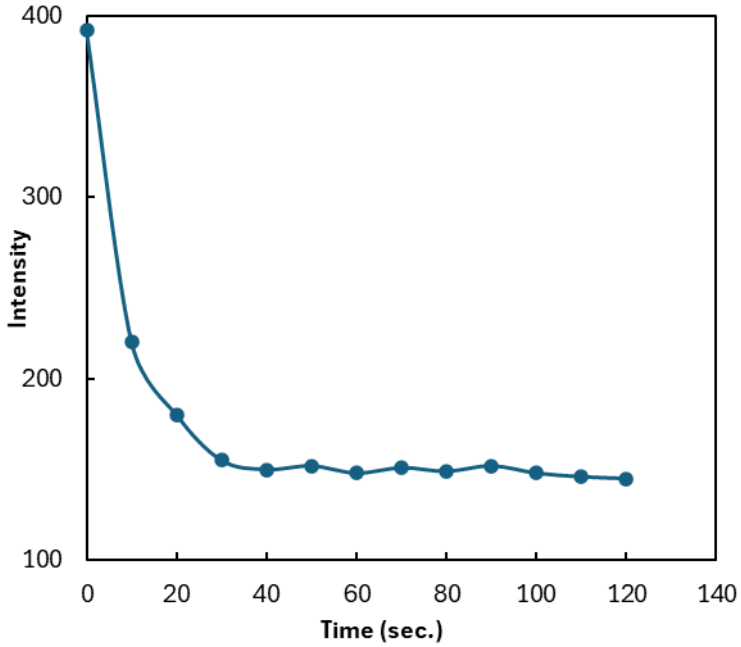

Figure S8: Response time of BNDA upon addition of Cu^{2+} (**5.0×10^{-6} M).**