SUPPORTING INFORMATION

Juniper-Based Cu@Activated Carbon Functionalized with Ethylenediamine: A *Green* Platform for Non-Enzymatic Detection of Dopamine

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3.1.2 Energy-dispersive X-ray spectroscopy (EDS) analysis

Table S1: Energy-dispersive X-ray spectroscopy of Cu@CA-COOH

Element	Wt%	Wt% Sigma	Atomic%
C	74.45	0.22	80
N	0.57	0.25	0.52
O	24.80	0.13	20
Cu	0.18	0.03	0.04
Total:	100.00		100.00

Table S2: Energy-dispersive X-ray spectroscopy of Cu@CA-COCl

Element	Wt%	Wt% Sigma	Atomic%
C	69.18	0.17	75
N	0.31	0.21	0.29
O	30.30	0.10	25

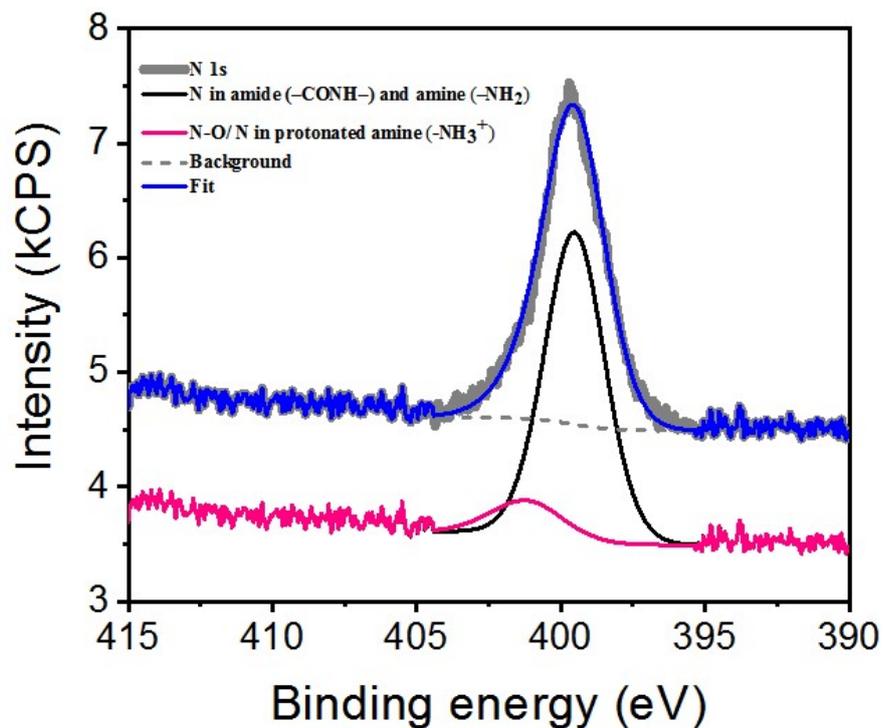| Cu	0.21	0.02	0.04
Total:	100.00		100.00

Figure S1. High-resolution core-level XP spectra of N 1s region registered for Cu@AC-CONH-CH₂CH₂-NH₂ powder sample.

3.1.3 Infrared Spectral Evolution of Composite at Different Functionalization Stages and N_2 Adsorption–Desorption of Cu-based NPs
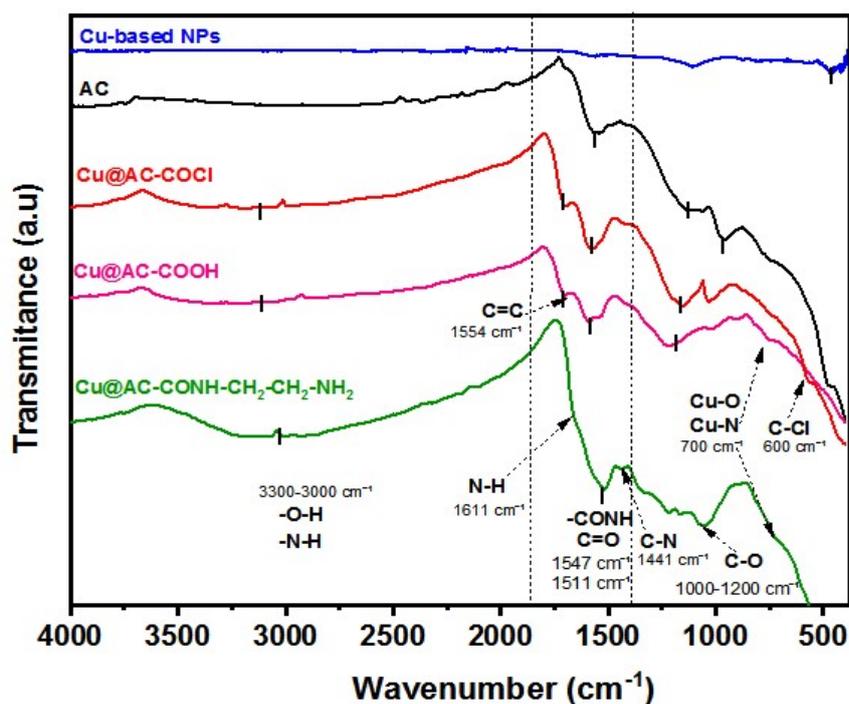
Figure S2. FTIR spectra at different stages of the composite material preparation: Cu-based NPs (*blue*), AC (*black*), Cu@AC-COCl (*red*), Cu@AC-COOH (*pink*), and Cu@AC-CONH-CH$_2$CH$_2$-NH$_2$ (*green*)

3.2 Electrochemical characterization of Cu@AC-CONH-CH$_2$CH$_2$-NH$_2$ nanocomposites

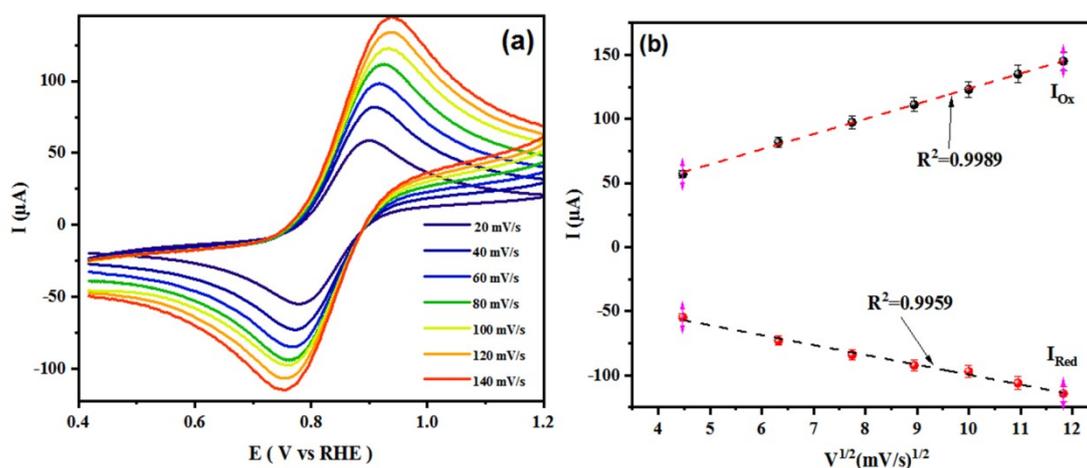## 3.2.1 Cyclic Voltammetry in the Ferri/Ferro redox couple

Figure S3. (a) Cyclic voltammograms of Cu@AC-COOH recorded at different scan rates (20–140 mV s⁻¹) in in 5 mM $[Fe(CN)_6]^{3-}/^{4-}$ solution .(b) Variation of anodic and cathodic peak currents with the square root of scan rate.
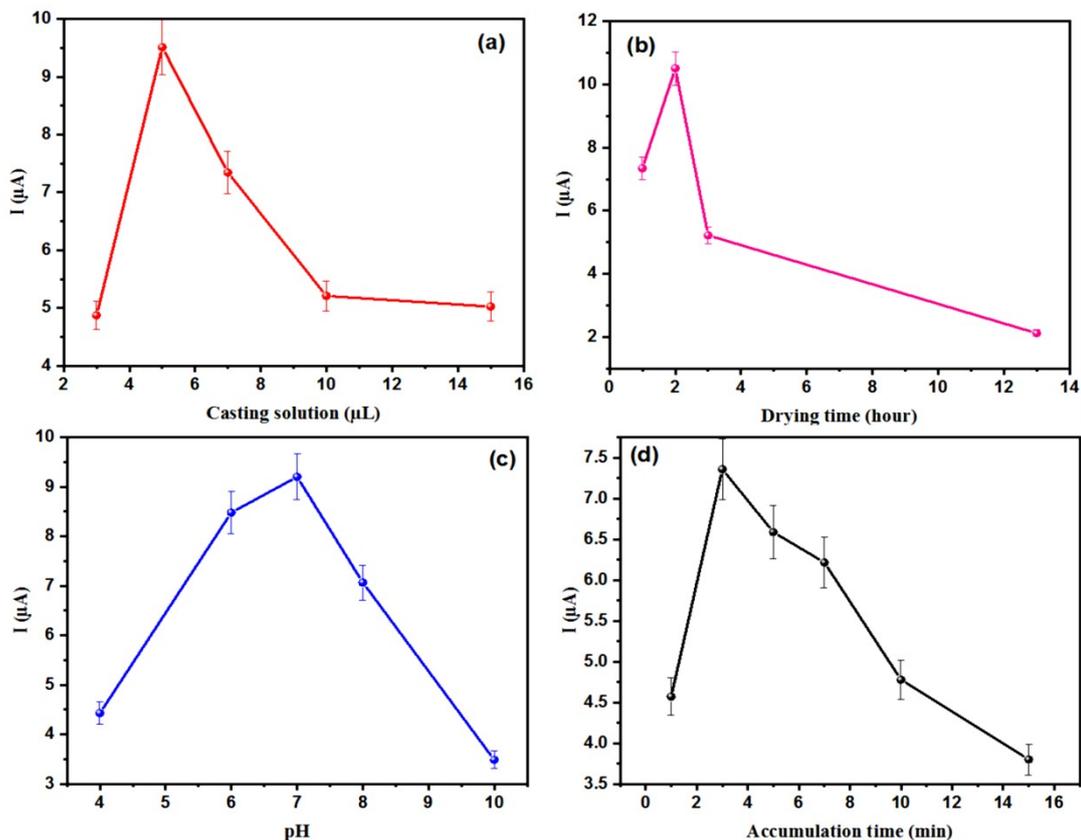
4.1 Optimization of experimental conditions.

Figure S4. Influence of a) Cu@CA-CONH₂CH₂CH₂-NH₂ amount deposited on the sensor, b) drying time, c) pH value of the buffer solution, and d) accumulation time on the voltammetric response of Cu@CA-CONH₂CH₂CH₂-NH₂ /GCE in PBS (0.1M) contained 1×10^{-5} M of DA. The error bars indicate the standard deviation calculated from three independent measurements (n = 3).

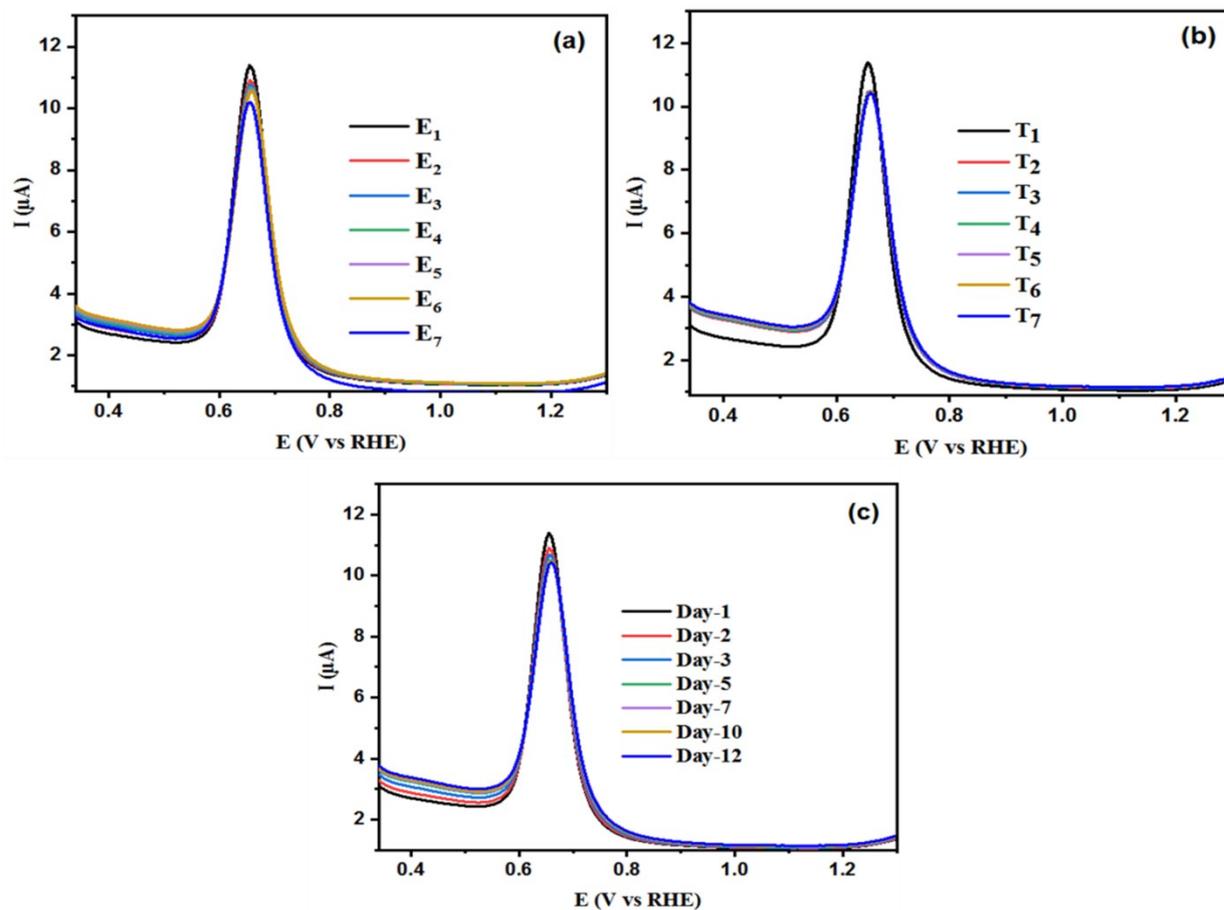## 4.4. Stability, repeatability and reproducibility

Figure S5 Repeatability, reproducibility, and stability evaluation of the prepared electrodes using DPV: (a) reproducibility across six independently prepared electrodes (E1–E7); (b) repeatability of the same electrode over seven measurements (T1–T7); (c) stability over 12 days.
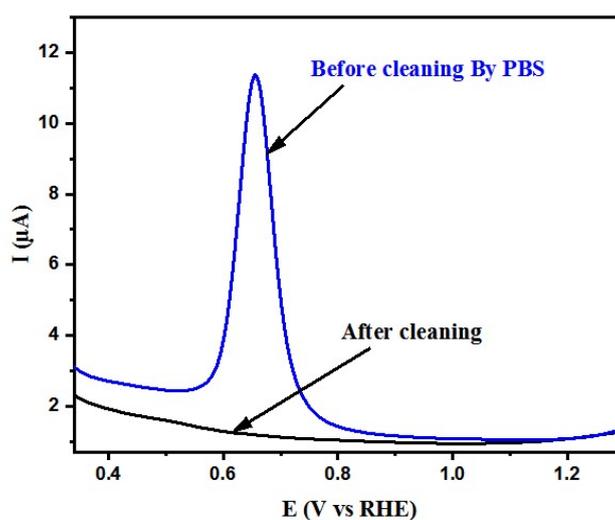
Figure S6. DPV for sensor regeneration using 2M PBS at pH 7.0.