Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Crystal Plane Integrated Strontium Oxide/Hexagonal Boron Nitride Nanohybrid For Rapid Electrochemical Sensing of Anticancer Drug In Human Blood Serum Sample

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2.1. Materials and reagents

All the chemicals and reagents [bulk boron nitride (h-BN) (≥99% SRL), strontium cholride hexahydrate ($SrCl_2.6H_2O$) (≥99% SRL), sodium hydroxide (NaOH) (≥98% FISHER), acetonitrile, ethanol, methanol, 5-fluorouracil ($C_4H_3FN_2O_2$) (≥99% SRL), uric acid ($C_5H_4N_4O_3$) (≥99% SRL), lactose ($C_{12}H_{22}O_{11}$) (≥98% SRL), oxalic acid (≥99.5% AR), ascorbic acid ($C_6H_8O_6$) (≥99.7% SRL), dopamine ($C_8H_{11}NO_2$) (≥99% SRL), L-cysteine ($C_3H_7NO_2S$) (≥99% SRL), glucose ($C_6H_{12}O_6$) (≥99% SRL), potassium ferricyanide ($C_6N_6FeK_3$) (≥99% SRL), potassium ferrocyanide ($C_6FeK_4N_6$) (≥99% SRL), potassium chloride (KCl) (99.8% Fisher), monosodium hydrogen phosphate (NaH_2PO_4) (≥99% SRL), and disodium hydrogen phosphate (Na_2HPO_4) (≥99% SRL)] are purchased in Sigma Aldrich and Alfa Aesar. To create a stock solution, ultrapure deionized water was used. NaH_2PO_4 and Na_2HPO_4 were combined to create 0.1 M phosphate buffer (PBS) (pH = 7.0) to detect 5-Fu. The human blood serum sample was collected from SRM Medical College Hospital and Research Center, Kattankulathur, Tamil Nadu, for real sample analysis. All the experiments were done using Milli-Q-water (18.2 MΩ cm @ 25 ± 2 °C).

2.2. Materials characterization

High-resolution scanning electron microscopy (HR-SEM, Thermoscientific Apreo S) and transmission electron microscopy (TEM, JEM-2100 Plus, JEOL) were utilized to predict the morphological, surface properties, and chemical content, and the selected area electron diffraction (SAED) pattern of produced SrO, h-BN, and SrO/h-BN hybrid. Energy dispersive spectroscopy (EDS-JEM-2100 Plus, JEOL, and Thermoscientific Apreo S) was utilized for elemental and chemical composition. The crystalline nature of the synthesized compound was examined by using X-ray diffraction spectroscopy (XRD system-X'pert powder, with Cu-Kα radiation (λ = 0.154 nm) Malvern Panalytical, United Kingdom) at 45 kV (tension) and 40 mA (current) with 0.02° per step scan and 1° per min speed. The Raman Spectroscopy technique analyzed the Vibrational modes of the synthesized materials. The Oxidation state of the prepared SrO/h-BN composite was analyzed by XPS analysis (). The cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), differential pulse voltammetry (DPV), and amperometry (*i–t* curve) studies were carried out using a CHI electrochemical workstation (CHI 760E, USA). All the measurements were performed at room temperature using a three-electrode setup. The counter, reference, and working electrodes were platinum wire (Pt), Ag/AgCl (3 M KCl), and glassy carbon electrode (GCE), respectively.

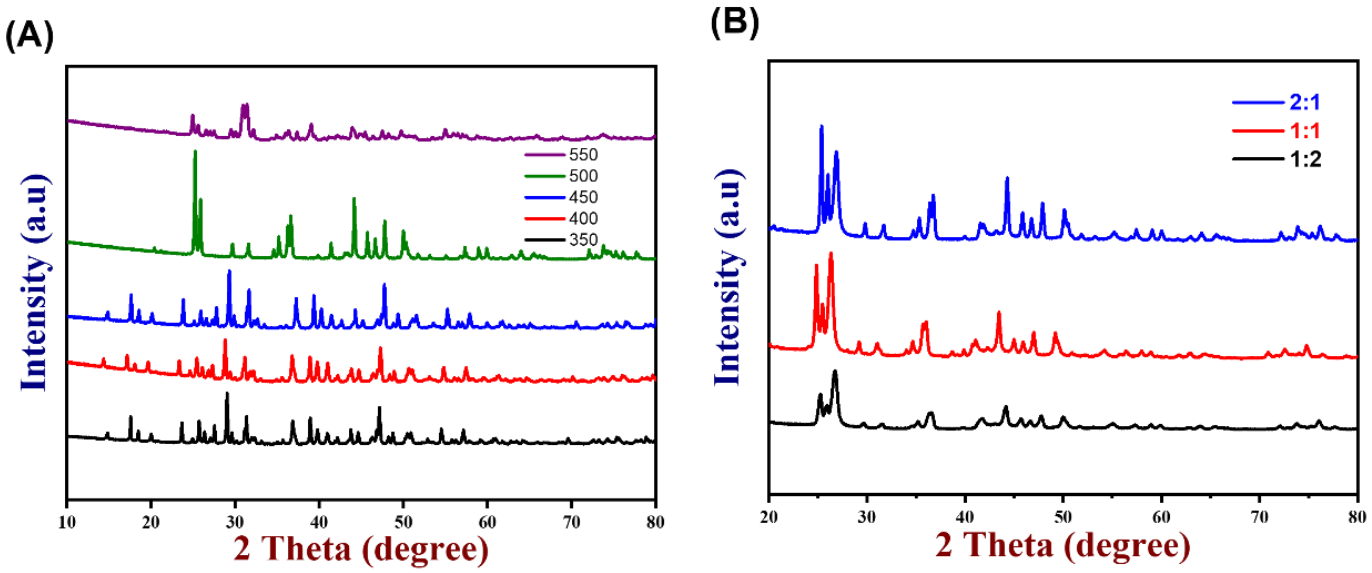

Figure S1. (A) XRD spectra of different calcination of strontium oxide and **(B)** different ratios (1:1, 1:2, 2:1) of strontium oxide: h-boron nitride.

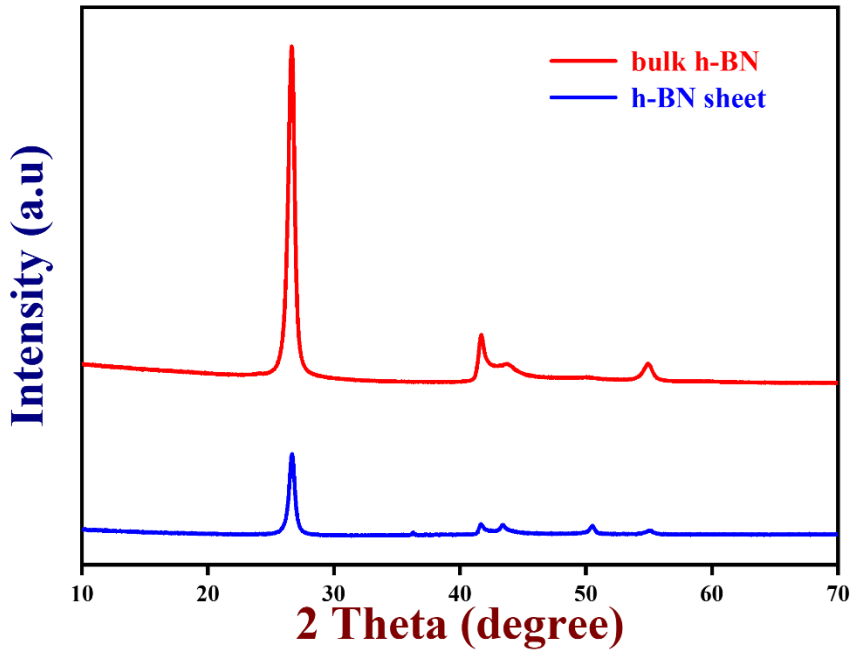

Figure S2. XRD spectra of Bulk h-BN and h-BN sheet

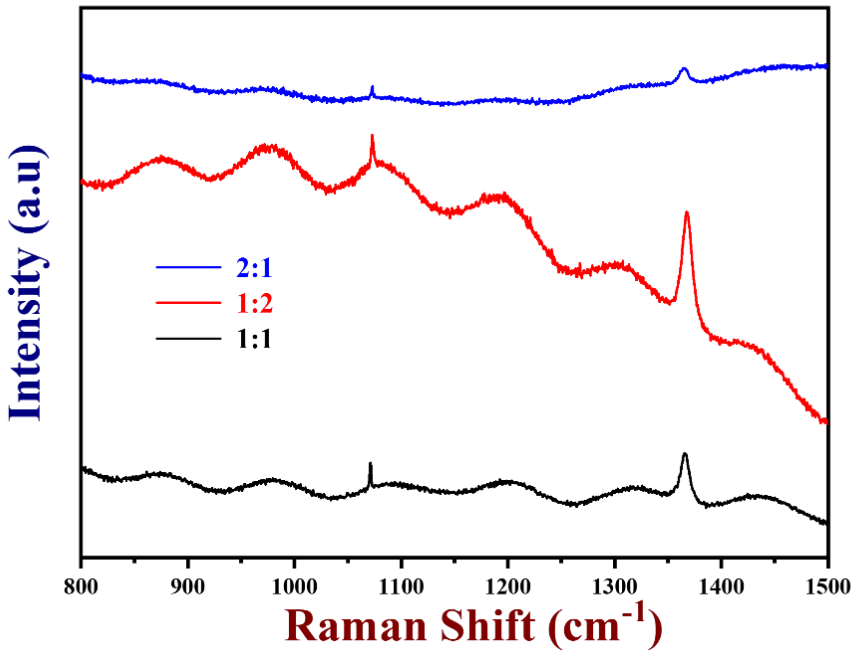

Figure S3. Raman spectra of different ratios of SrO:h-BN (1:1), (1:2) and (2:1)

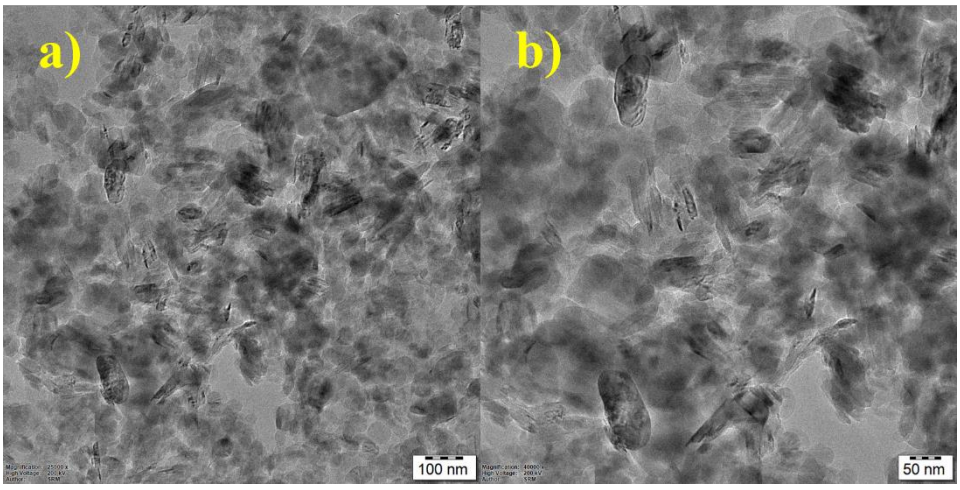

Figure S4. TEM images of a) & b) SrO/h-BN

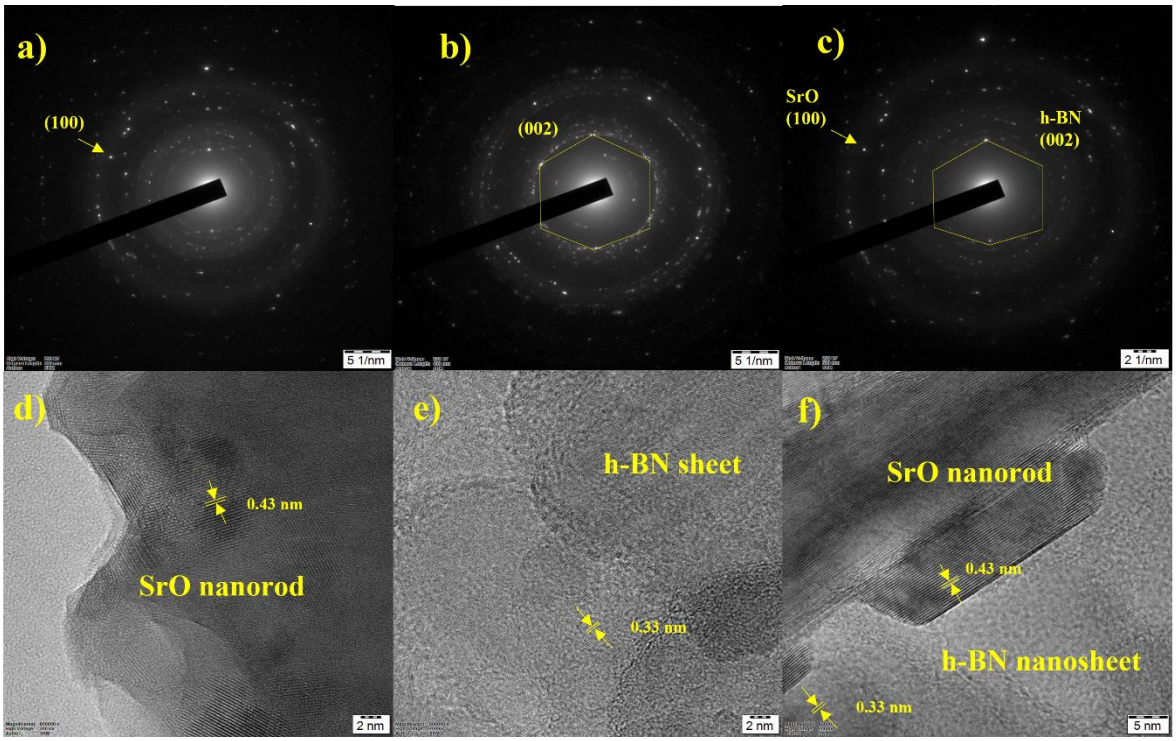

Figure S5. SAED pattern and lattice fringes of SrO (a, d), h-BN (b, e) and SrO/h-BN (c, f).

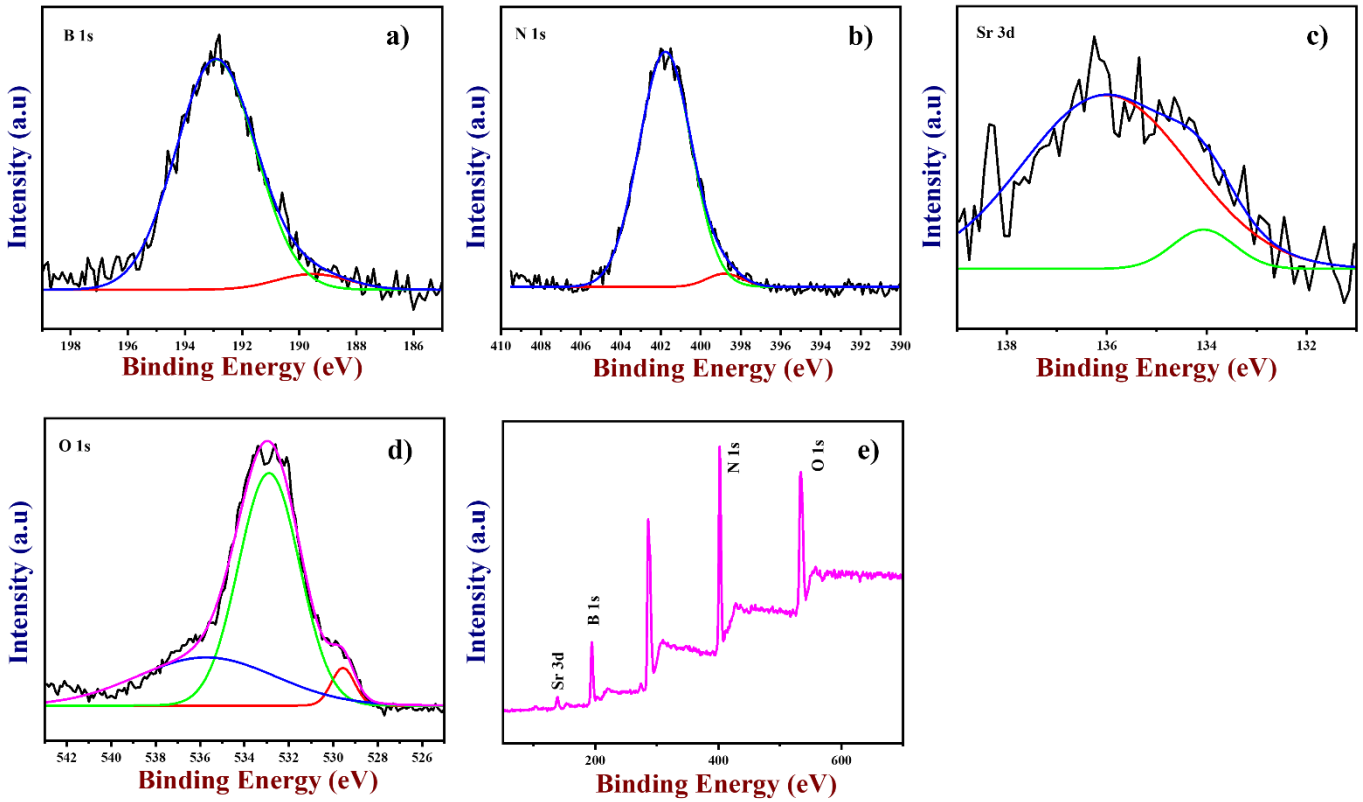

Figure S6. XPS spectrum of **a)** B 1s, **b)** N 1s, **c)** Sr 3d, **d)** O 1s and **e)** Survey spectrum of SrO/h-BN composite

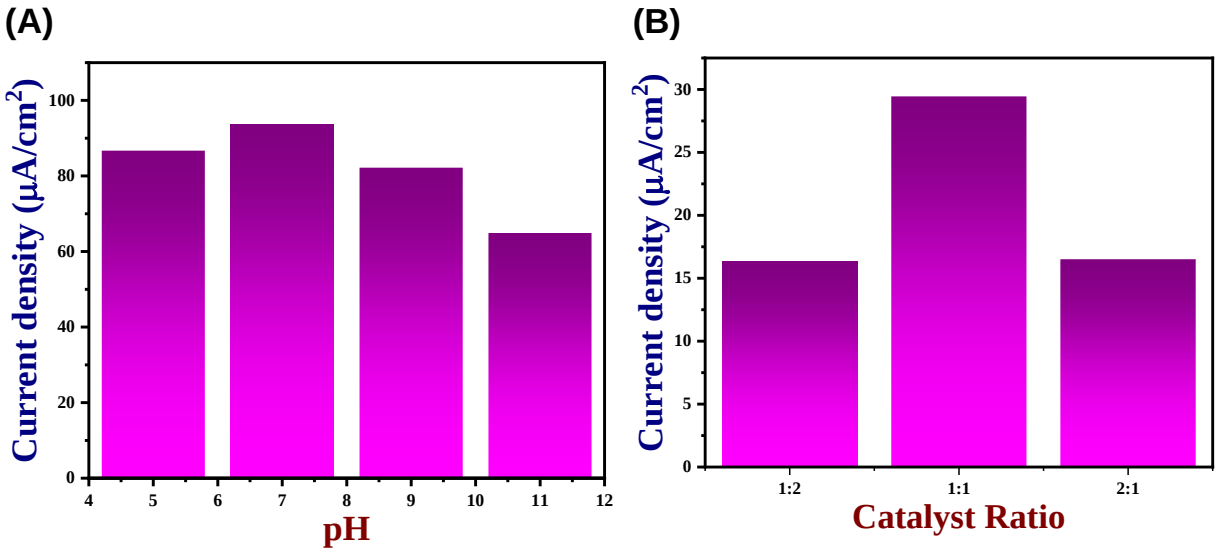

Figure S7. (A) Histogram of pH *vs*. current density and **(B)** the Catalyst ratio *vs*. current density.

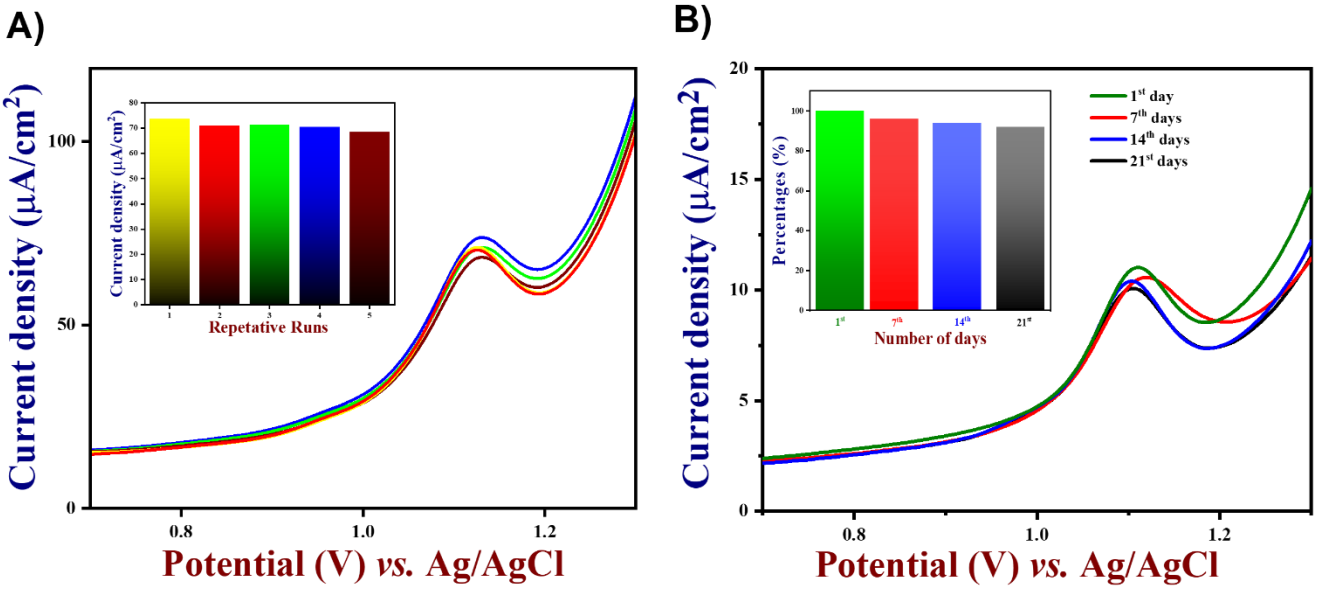

Figure S8. (A) Repeatability study (inset: histogram of 5 repetitive runs of electrodes and **(B)** Stability study of SrO/h-BN/GCE with 5-Fu by DPV.

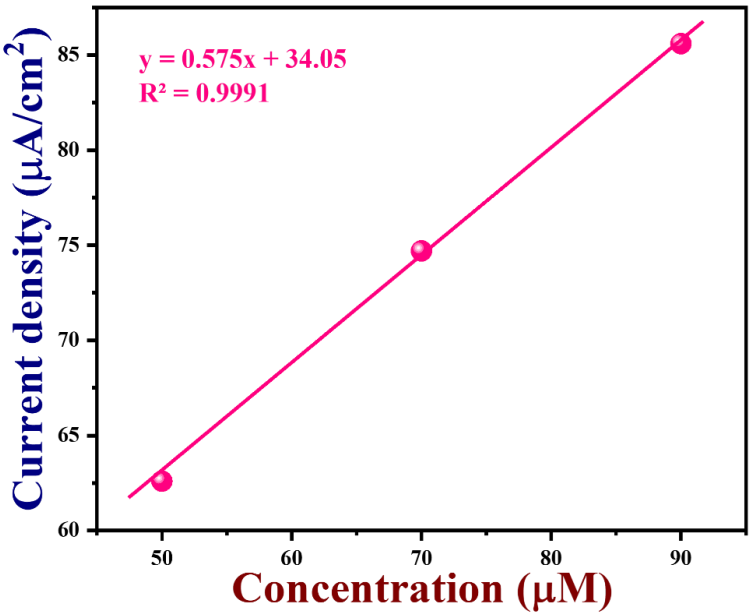

Figure S9. The kinetic plot of real sample analysis with current density *vs.* concentration

S.NO	Modified Electrodes	E_{pa} (V)	E_{pc} (V)	R_{ct} (ohm)	J_{pa} (mA/cm^2)	J_{pc} (mA/cm^2)	E_p (mV)
1	bare GCE	320	090	3336	0.607	-0.633	230
2	SrO/GCE	280	087	1756	0.893	-0.926	193
3	h-BN/GCE	260	094	1650	0.883	-0.931	166
4	SrO/h-BN/GCE	245	132	506	1.010	-1.103	113

Table S1. CV's profiles of all modified charge transfer electrodes, E_p, potentials and current densities of bare GCE, SrO/GCE, h-BN/GCE and SrO/h-BN/GCE.