Electronic Supplementary Information (ESI)

Bifunctional fluorescent carbon nanodots: green synthesis via soy milk and as metal-free electrocatalysts for oxygen reduction

EXPERIMENTAL SECTION

Chemicals. Soybean was brought from local supermarket. Commercial E-TEK Pt/C catalyst was purchased from Alfa Aesar.

Apparatus: TEM measurements were made on a HITACHI H-8100 EM with an accelerating voltage of 200 kV. X-ray diffraction (XRD) spectra were obtained using a D8 ADVANCE (Germany) using Cu K (1.5406 Å) radiation. X-ray photoelectron spectroscopy (XPS) analysis was carried on an ESCALAB MK II X-ray photoelectron spectrometer. Fluorescence measurements were carried out on a LS-55 luminescence spectrometer (Perkin-Elmer). Electrochemical experiments (Cyclic voltammetry and Chronoamperometry) were performed on a CHI 832 electrochemical analyzer (CH Instruments, Chenhua Co., Shanghai, China). A conventional three electrode cell was used, including an Ag/AgCl (saturated KCl) electrode as reference electrode, a platinum wire as counter electrode, and the bare and modified glassy carbon electrode (GCE, 3 mm in diameter) as working electrode.

Synthesis of fluorescent carbon nanodots: Soy milk can be made at home with a soy milk machine. The resultant soy milk was filtrated before used. Then the mixture was transferred into a 50 mL Teflon-lined autoclave and heated at 180 ° C for 3 h. The fluorescent carbon nanodots were collected by removing the large dots though filtration.

Electrocatalytic experiment： Prior to the surface coating, Rotation ring-disk electrode (5 mm in diameter) was polished with 1.0 and 0.3 μm alumina slurry sequentially and then washed ultrasonically in water and ethanol for a few minutes, respectively. The cleaned electrode was dried with a high-purify nitrogen steam for

the next modification. A total of 10 μL of the products (1 mg/mL) or commercial E-TEK Pt/C catalyst was dropped on the pretreated electrode surface and dried at room temperature. Nafion (5 μL, 0.2% in aqueous solution) was then placed on the surface of the above materials modified electrodes and dried before electrochemical experiments.

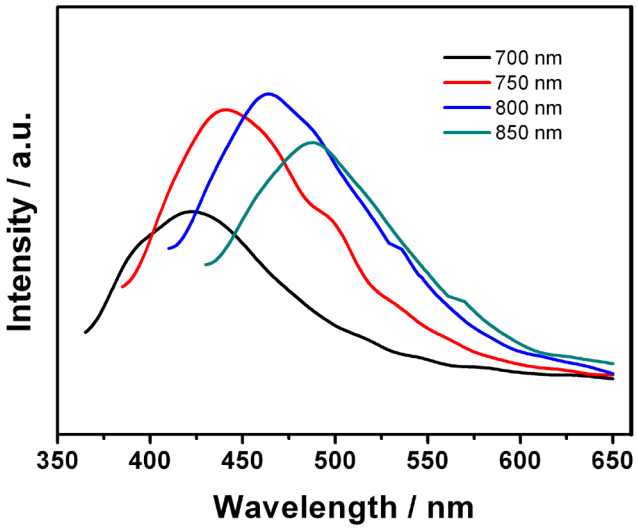

Fig. S1 Upconversion photoluminescence spectra of FCNs at different excitation wavelengths as indicated

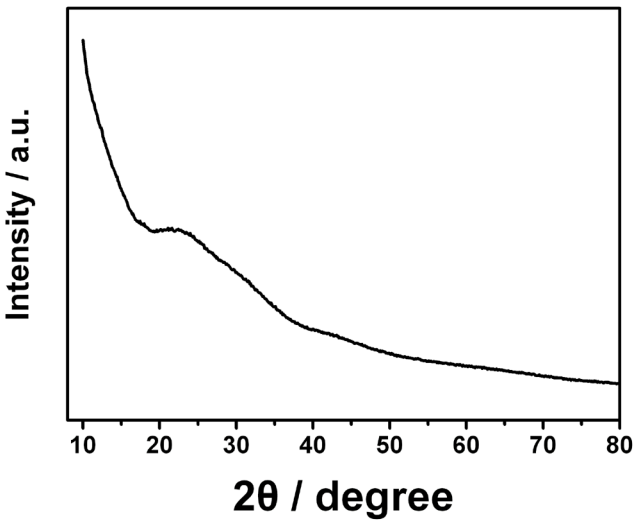

Fig. S2 XRD pattern of the obtained FCNs.

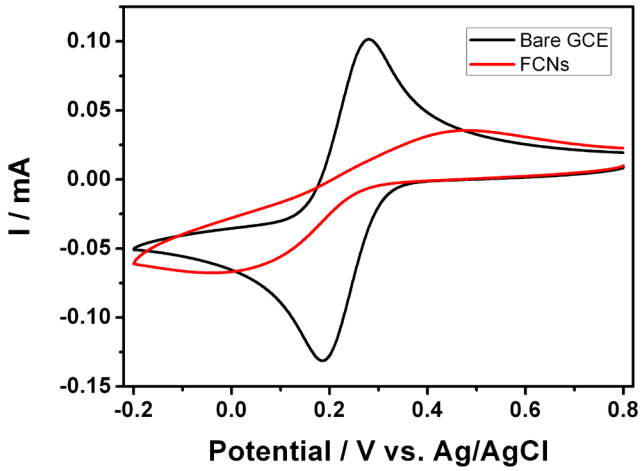

Fig. S3 CVs obtained at bare GCE and FCNs modified electrode in 0.10 M KCl solution containing 2.5 mM $K_3Fe(CN)_6$ and 2.5 mM $K_4Fe(CN)_6$.

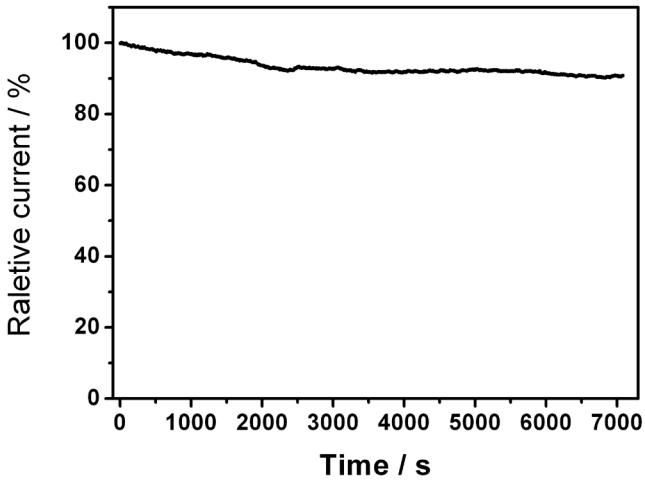

Fig. S4 The current-time (i-t) chronoamperometric responses for ORR at the FCNs at -0.4 V in an O_2-saturated 0.1M KOH solution at a rotation rate of 1000 rpm.