Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Supporting Information

Hydrothermally driven three-dimensional evolution of mesoporous hierarchical europium oxide hydrangea microspheres for non-enzymatic sensor of hydrogen peroxide detection

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Experimental Details

Materials preparation and methods: The preparation of nanosheets-constructed mesoporous Eu_2O_3 hydrangea microspheres (Eu_2O_3-ms) was accomplished by hydrothermal process followed by calcination. In hydrothermal process, 0.005 mol of glucose and 0.0075 mol of acrylic acid were dissolved in 40 mL of ultrapure water (from Purifier system with resistivity of 18.2 Ω) under magnetic stirring for 5 min, followed by the addition of 0.0025 mol of $Eu(NO_3)_3$ to form transparent solution. Then, ammonia solution (27 wt%) was gradually added into the above solution until pH reaches10. This as-formed suspension was stirred for 5 h and transferred into a 45 mL of Teflon-lined

autoclave, sealed and kept at 180 ^{o}C for 72 h. After the autoclave was naturally cooled down to room temperature, the achieved brown precipitate and suspension were centrifuged to separate, rinsed with ultrapure water and ethanol for 10 times before drying at 80 ^{o}C overnight. Subsequently, the samples were firstly calcined at 600 ^{o}C for 6 h under argon atmosphere using a tube furnace, followed by the calcination at 500 ^{o}C for 4 h under air. In control group, the Eu_2O_3 powder was prepared by calcination (at 600 ^{o}C for 6 h) of the dried europium hydroxide precipitate obtained from 0.05 M $Eu(NO_3)_3$ solution mixed with ammonia solution until pH gets 10.

Characterization: The crystal structures were examined by X-ray powder diffraction (XRD, GBC MMA diffractometer, Cu Kα radiation, λ=0.15406 nm). The morphologies of the samples were observed by filed-emission scanning electron microscopy (JEOL JSM-6701FESEM). The transmission electron microscopy (TEM) observations were performed on a JEOL JEM 2010 200 kV instrument. The specific surface areas calculated by Brunauer-Emmett-Teller (BET) method and pore size distribution by the Barret-Joyner-Halenda (BJH) method were examined using the adsorption isotherms of nitrogen at -196 °C on a Quantachrome Aurosorb-6B apparatus. The X-ray photoelectron spectroscopy (XPS) measurement was obtained on an ESCALAB 250XI photoelectron spectrometer (Thermo Fisher Scientific, USA) spectrometer together with the Al Kα 1846.6 eV anode. C 1s peak at 284.6 eV was the reference for binding energy calibration.

Electrode preparation and electrochemical measurement: Electrochemical measurements were performed on a CHI 660D electrochemical work-station (Shanghai Chenhua Instrument, China) with a three-electrode configuration. Ag/AgCl electrode

(soaked with KCl) acted as the reference electrode, and Pt wire as the ancillary electrode. Catalyst ink typically consists of 5 mg of catalyst in 2 mL of ethanol, together with the addition of 0.5 mL of 0.05 wt.% of Nafion solution and ultrasonication until homogeneously suspended. 5 μL of ink was pipetted onto the glassy carbon electrode. Electrolyte was formed by 0.1 M NaOH aqueous solution which was purged with nitrogen for 30 min in order to remove the dissolved oxygen. Upon gradual addition of H_2O_2, a silent magnetic stirring was utilized in liquid phase to facilitate the mass transport. The as-prepared sensor was stocked in 0.1 M NaOH solution.

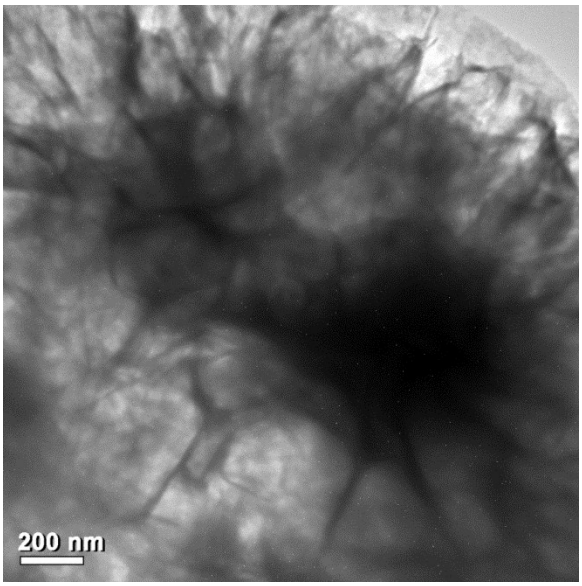

Fig. S1. TEM image of europium oxide hydrangea microsphere.

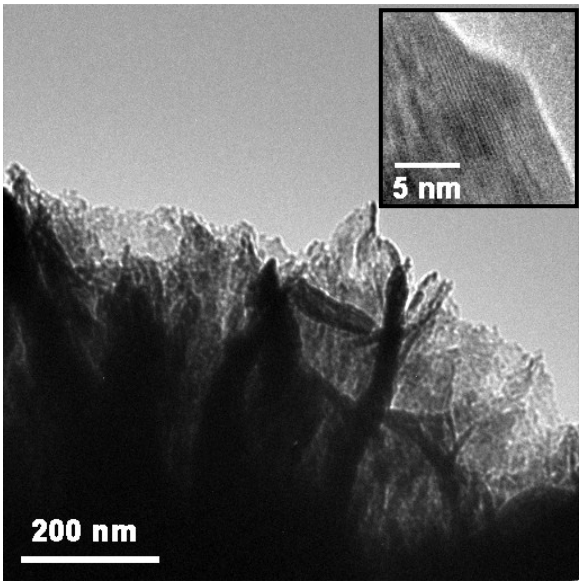

Fig. S2. TEM image of edge of europium oxide nanosheets-constructed hydrangea microsphere with HRTEM image as the inset.

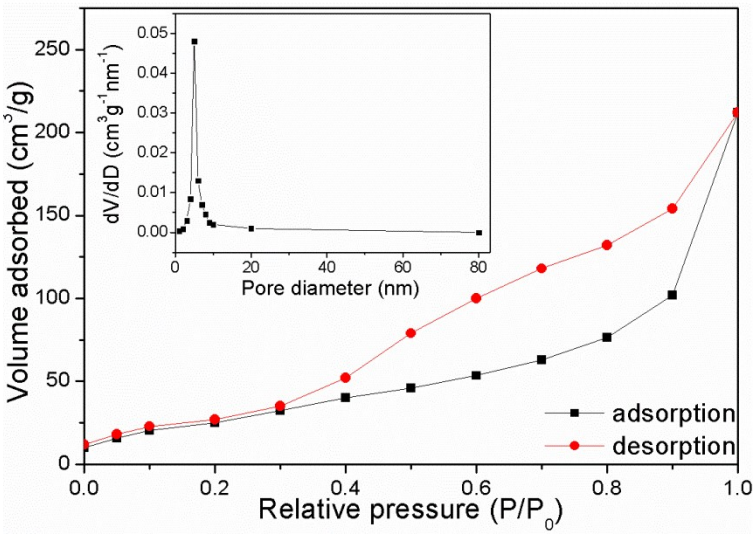

Fig. S3. N_2-sorption isotherms (BET measurement) of Eu_2O_3 hydrangea microspheres, the BJH pore size distribution diagram is shown in the inset.

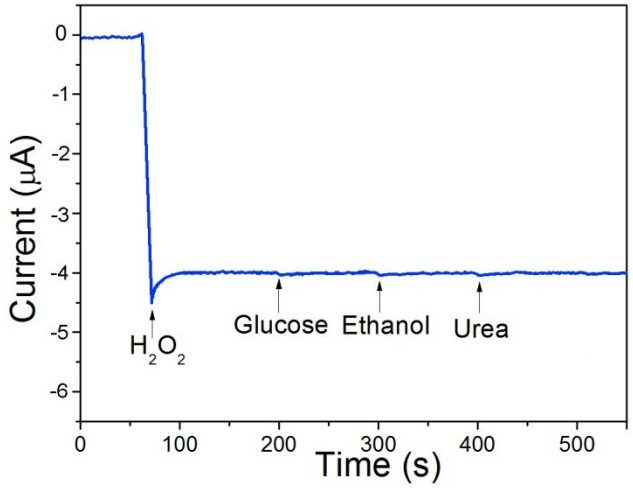

Fig. S4. Amperometric response of Eu_2O_3-ms to 100 μM of H_2O_2, 10 μM of ethanol, 10 μM of glucose, 10 μM of urea, implying the high selectivity toward H_2O_2. Glucose, ethanol and urea cannot bring in any significant interference to H_2O_2 detection.