Electronic Supplementary Information for

Catalytic-induced Sensing Effect of Triangular CeO_2 Nanoflakes for Enhanced BTEX Vapor Detection with Conventional ZnO Gas Sensors

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S1. Preparation of CeO_2 nanomaterials

CeO_2 nanomaetrials with different morphologies were prepared by hydrothermal method. In a typical process, the $Ce(NO_3)_3$ solution was first obtained by dissolving 0.068 g of $Ce(NO_3)_3 \cdot 6H_2O$ in 5 mL of deionized water. In addition, 9.6 g NaOH was dissolved in 35 mL deionized water. And then, the $Ce(NO_3)_3$ solution was dropped into NaOH solution with continuously stirring at room temperature. After stirring for 30 minutes, the mixture was hydrothermally treated at 100 ℃ in a 50 mL Teflon-lined autoclave for 24 h. The precursor was then washed several times with deionized water

and ethanol and dried for 10 h at 80 ℃. The final CeO_2 nanorods were obtained by heat treatment for 3 h at 500 ℃. The CeO_2 microsphere was obtained by the similar hydrothermal method, except that 60 mmol urea was used instead of NaOH. CeO_2 micro-polyhedrons was prepared by the similar method to CeO_2 nanorods with the 180 ℃ hydrothermal treatment.

S2. Materials Characterization

To characterize the morphology of the as-prepared samples, FE-SEM (FEI, Quanta FEG 450, USA) and Tecnai G220S-Twin transmission electron microscope were used with an accelerating voltage of 120 and 200 kV, respectively. The crystalline structure was analysed by using XRD (Breker, D8 Advance, Germany) with Cu-Kα ($\lambda = 0.15418$ nm) radiation in the range of 10-70° at room temperature. The Raman spectra measurements were conducted by using Raman Microscopy (Horiba, LabRAM HR Evolution, France) with an excitation wavelength of 532 nm. On-line mass spectrum (on-line MS) was implemented on a Pfeiffer ThermoStar mass spectrometer.

S3. Gas sensor measurement

The gas sensing performance of gas sensor was measured by a static test system (Elite tech co. LTD) and the test gases were obtained by static distribution method. For the reducing gases and n-type MOS, the response of gas sensors is defined as $S=R_a/R_g$, where R_a is the gas sensor's resistance in air atmosphere and R_g is the resistance of gas sensor in target molecules contained atmosphere. The response and recovery time are defined as the time taken by the gas sensor to achieve the resistance changes ranging from R_a to R_a-90% (R_a-R_g) and from R_g to R_g+90% (R_a-R_g) in the case of adsorption and desorption of target gases, respectively. The exact values of temperature and relative humidity (RH) are

recorded by using a digital thermo-hygrometer (Dretec, model O251) which is prior placed on the testing chamber.

S4. Online MS experimental setup

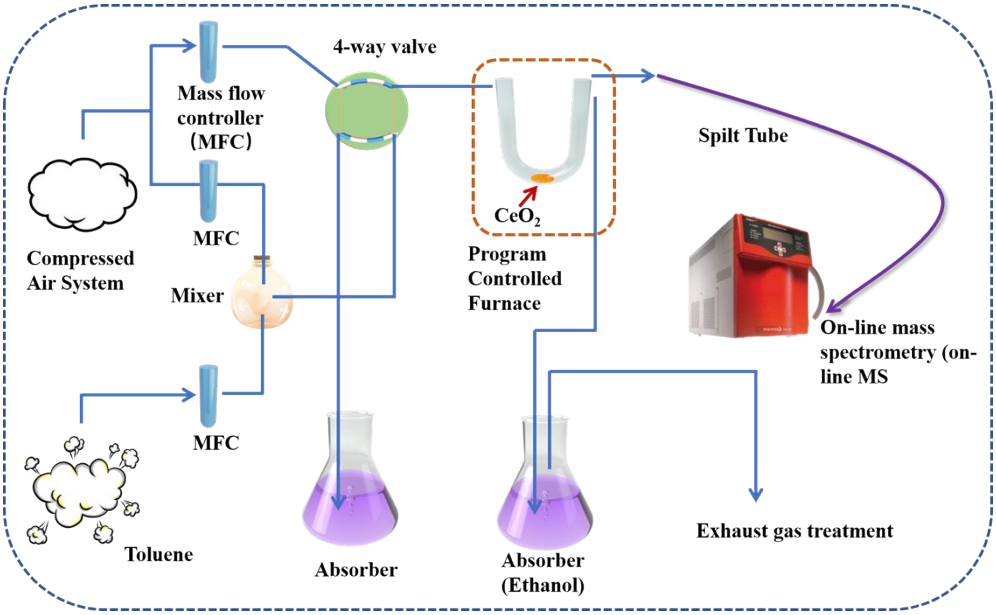

Fig. S1 Experimental setup for sensing product identification.

S5. Characterization results of CeO_2 materials

Table S1 Physicochemical characteristics of CeO_2 nanomaterials

Samples	Morphology [a]	Crystallite size [b] (nm)	I_{597}/I_{460} [c] (%)
CeO_2-MSs	Microsphere	12.3	1.1
CeO_2-MPHs	Micro-polyhedrons	30.9	3.1
CeO_2-NRs	Nanorod	17.5	4.7
CeO_2-NFs	Nanoflakes	10.3	11.7

[a] The morphology of CeO_2 was obtained by SEM images in the Fig. 2(a-d), [b] the crystallite size of CeO_2 was estimated by using Scherrer equation based on XRD patterns in Fig. 2(e) of the manuscript, [c] the values of I_{597}/I_{460} was calculated by Raman spectra in Fig. 4(b).