Ultrasensitive hydrazine sensor fabrication based on Co-doped ZSM-5 zeolites for environmental safety

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Electronic Supplemental Information

(Ψ) Choice of materials:

Co-ZSM-5 zeolites have employed a great deal of consideration due to their chemical, structural, physical, and optical properties in terms of large-active surface area, high-stability, high porosity, and permeability, which directly dependent on the structural morphology prepared by reactant precursors. Series of cobalt-exchanged ZSM-5 zeolite was prepared by heating a mechanical precursor mixture of cobalt(II)acetate tetra-hydrate with NH_4-ZSM-5 with a target exchange level in the range 10–150 % at 500 °C for 3 h in static air. Structural morphological, electrical and chemical properties of Co-ZSM-5 materials are of huge significance from the scientific aspect, compared to other un-exchanged zeolite materials. Non-stoichiometry, mostly oxygen vacancies, makes it conducting nature in the doped nanomaterials. The formation energy of oxygen vacancies and metal interstitials in semiconductor is very low and thus these defects form eagerly, resulting in the experimentally elevated conductivity of Co-ZSM-5 zeolites compared to other normal

zeolite materials such as ZSM or ZSM-5. Co-ZSM-5 materials have also attracted considerable interest owing to their potential applications in fabricating opto-electronics, electro-analytical, selective detection of bioassays, biological devices, hybrid-composites, electron-field emission sources for emission exhibits, biochemical detections, and surface-enhanced Raman properties etc. Co-ZSM-5 materials offer improved performance due to the large-active surface area which increased of conductivity and current responses of Co-ZSM-5/Nafion/GCE assembly during electrochemical investigation.

(Φ) Analyses of different exchange level of Co-into ZSM-5 for pyridine adsorption.

The obtained mixture was calcined for 3 h at 500 °C using heating rate of 4 °C/min, cooled to room temperature, and placed in a bottle.

Exchange level	Wt. of $Co(CH_3COO)_2 \cdot 4H_2O$ [g]	Wt. of zeolite [g]	Co [%]
10	0.0327	2	0.372
25	0.0817	2	0.93
50	0.1634	2	1.86
75	0.2451	2	2.79
100	0.3267	2	3.72
150	0.4902	2	5.58

Estimation pyridine adsorption:

	Area	E.L.
0	0.04987	
10	0.04568	8.4
25	0.04062	18.5
50	0.02708	45.6
75	0.01538	69.2
100	0.01303	73.9
150	0.01173	76.5