Electronic Supplementary Information for

Kilogram-scale synthesis of Pd-loaded quintuple-shelled Co_3O_4 microreactors and their application to ultrasensitive and ultraselective detection of methylbenzenes

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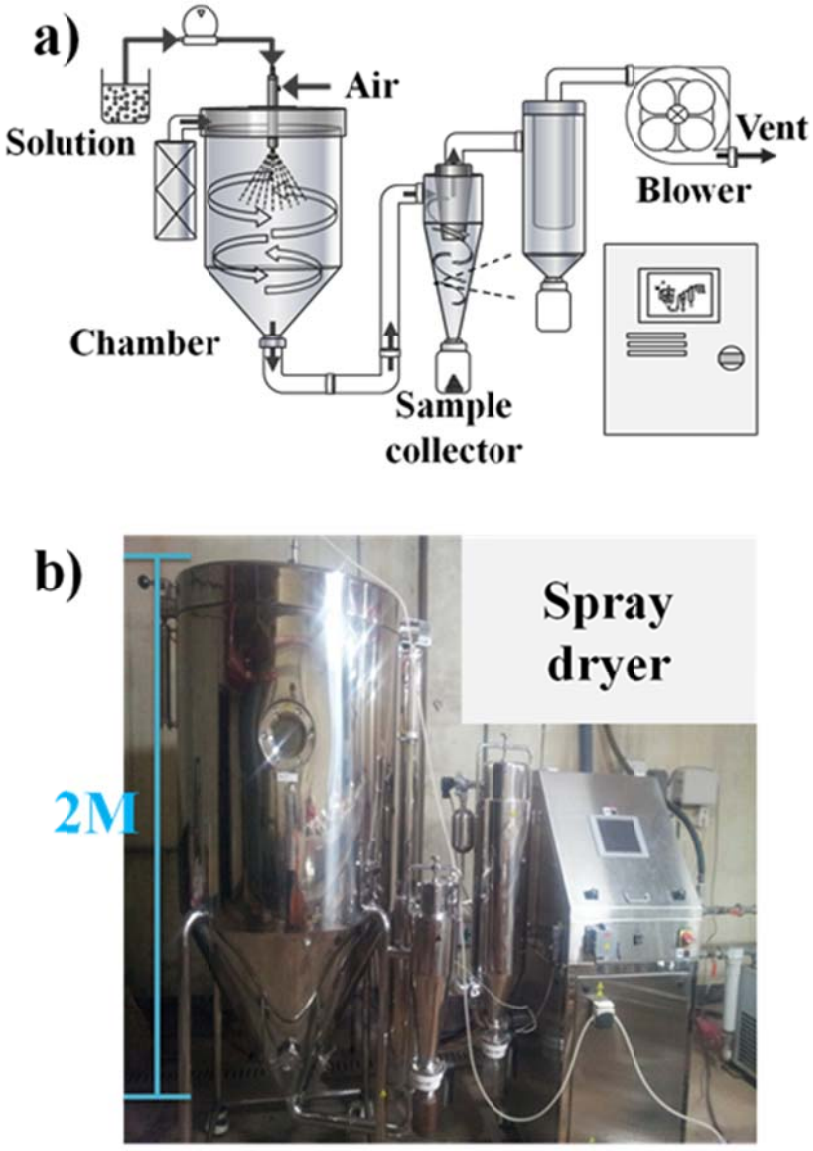

Figure S1. (a) Schematic diagram of the spray drying process and (b) experimental setup for the large-scale spray drying process.

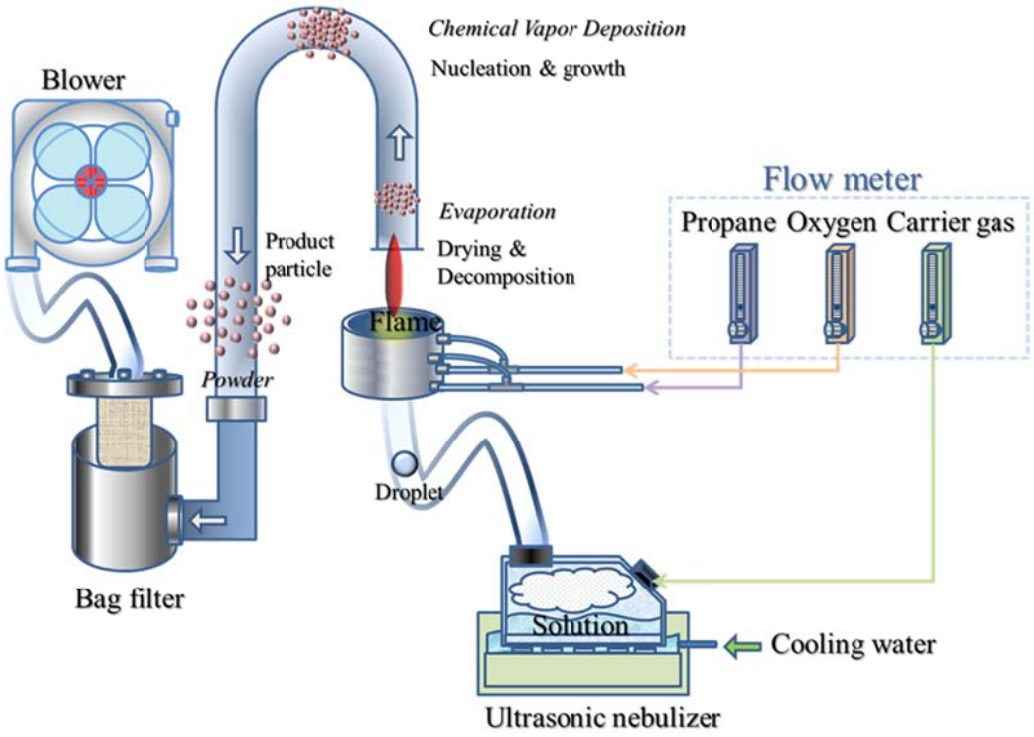

Figure S2. Schematic diagram of the flame spray pyrolysis process.

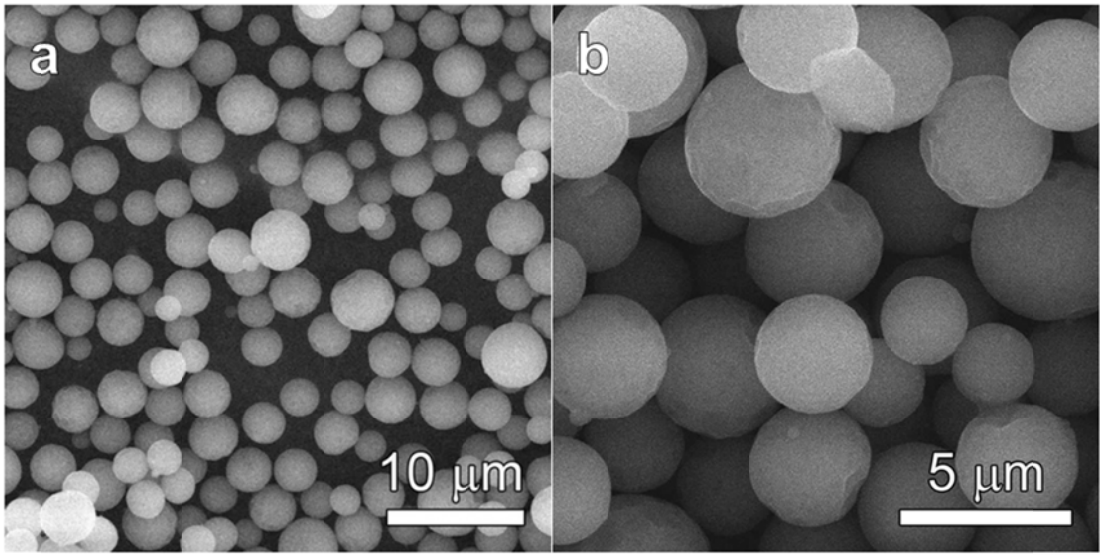

Figure S3. (a) Low-magnification (b) high-magnification SEM images of as-prepared precursor particles.

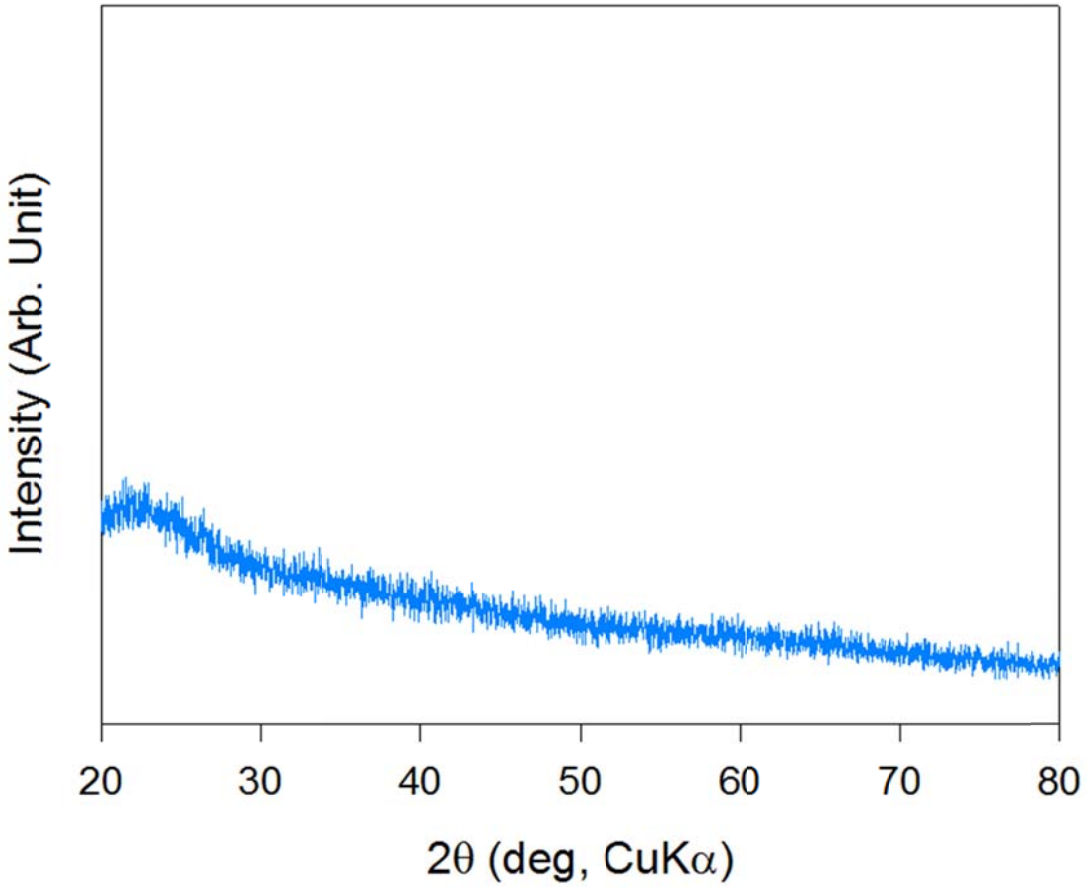

Figure S4. XRD pattern of the as-prepared precursor particles.

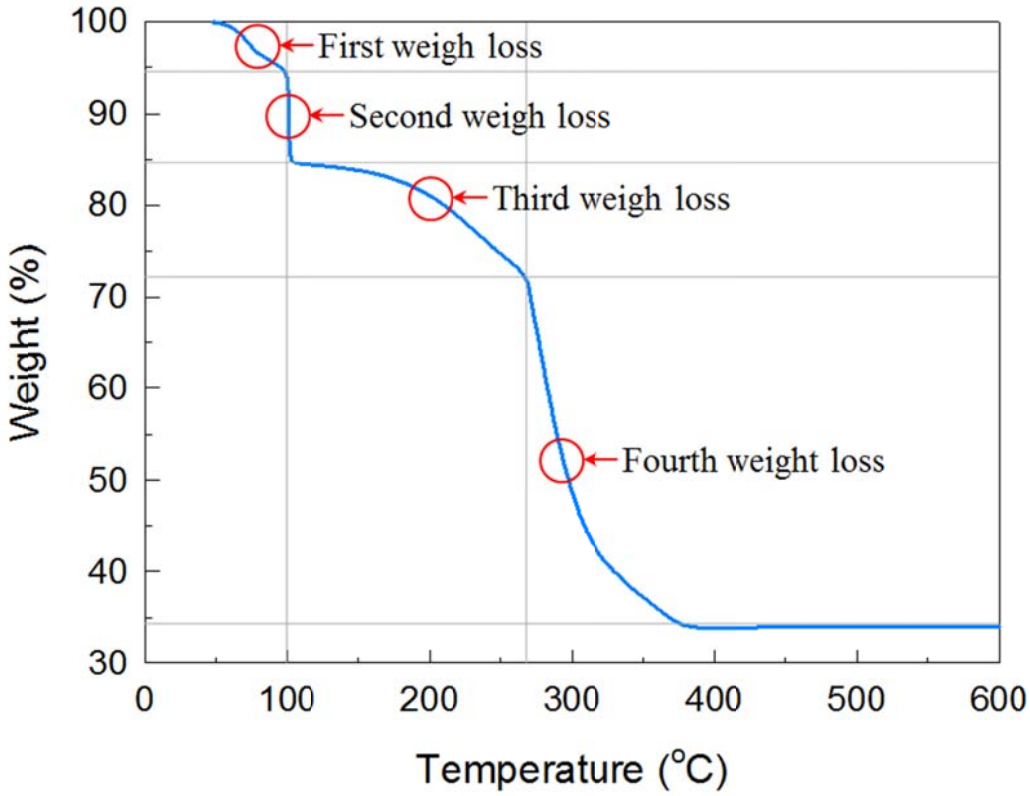

Figure S5. Thermogravimetric analysis (TGA) curves of the precursor powders obtained by the spray drying process.

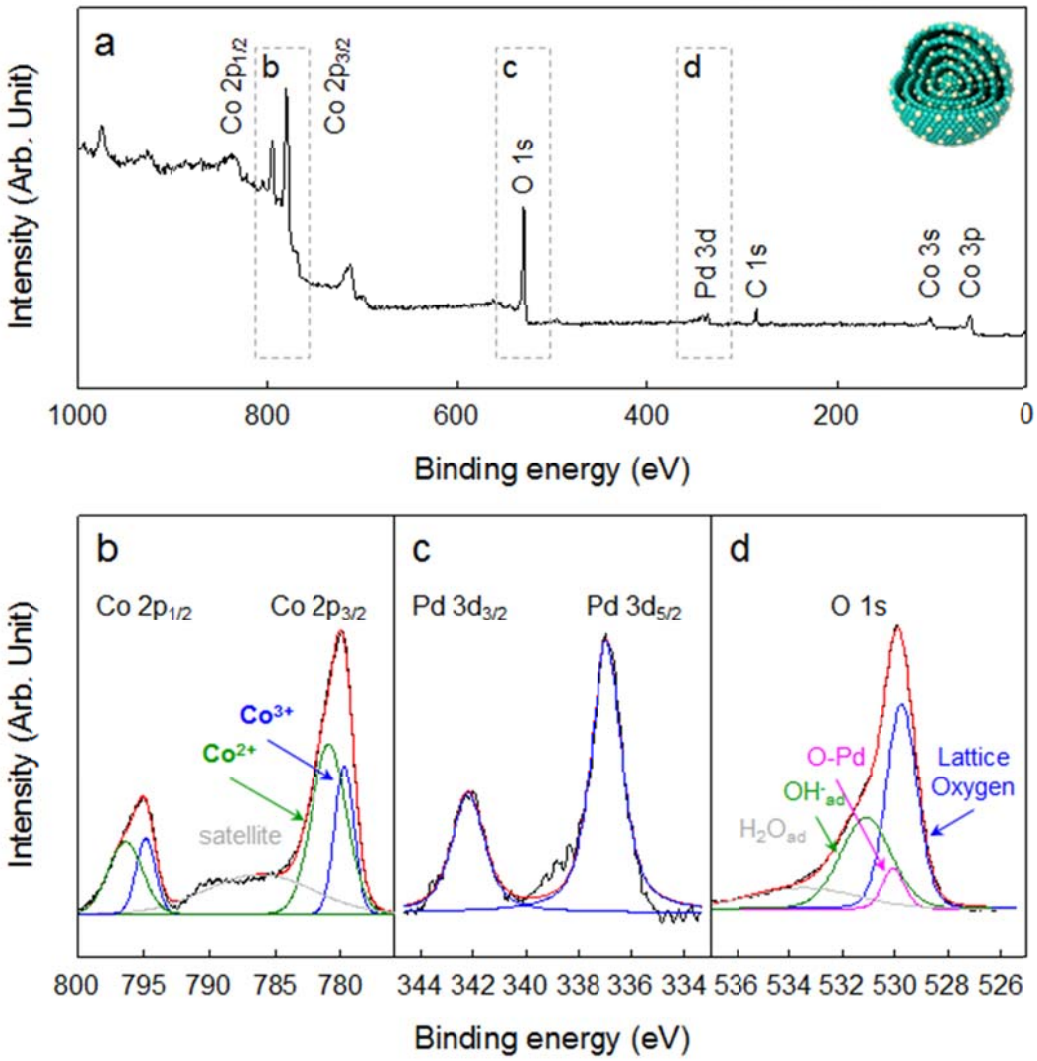

Figure S6. X-ray photoelectron spectroscopy (XPS) spectra of the 5 wt% Pd-Co_3O_4-MRs: (a) survey, (b) Co $2P_{1/2}$ and 2 $P_{3/2}$ peaks, (c) Pd 3 $d_{3/2}$ and 3 $d_{5/2}$ peaks, and (d) O 1s peak.

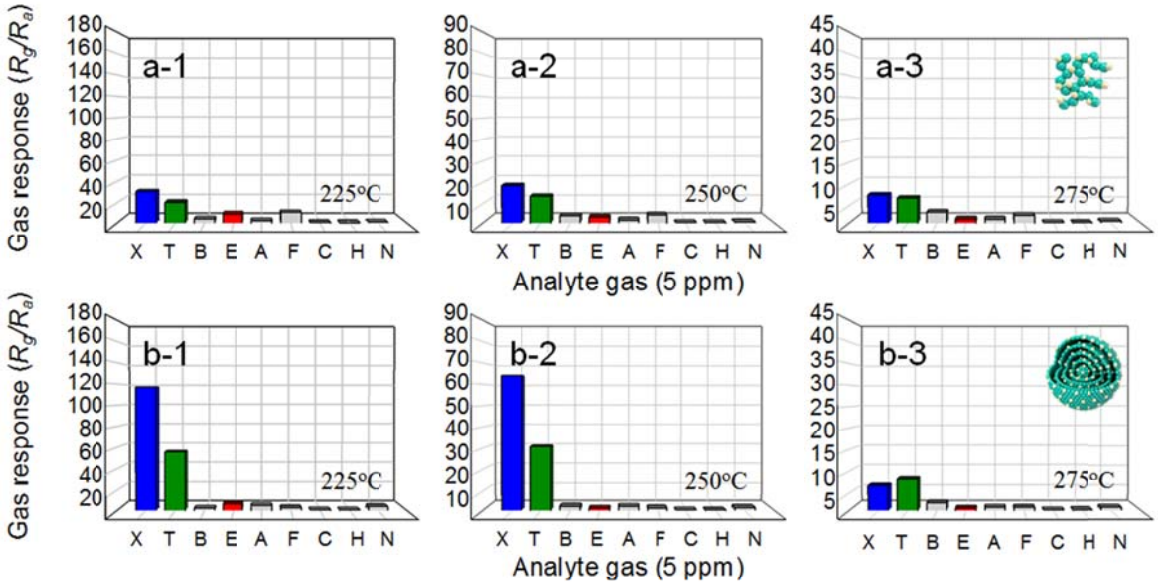

Figure S7. Gas responses (R_g/R_a) of the (a-1, a-2, and a-3) Pd-Co_3O_4-NPs and (b-1, b-2, and b-3) Pd-Co_3O_4-MRs to 5 ppm *p*-xylene (X), toluene (T), benzene (B), ethanol (E), ammonia (A), formaldehyde (F), carbon monoxide (C), hydrogen (H), and nitrogen monoxide (N) at (a-1 and b-1) 225, (a-2 and b-2) 250, and (a-3 and b-3) 275 °C.

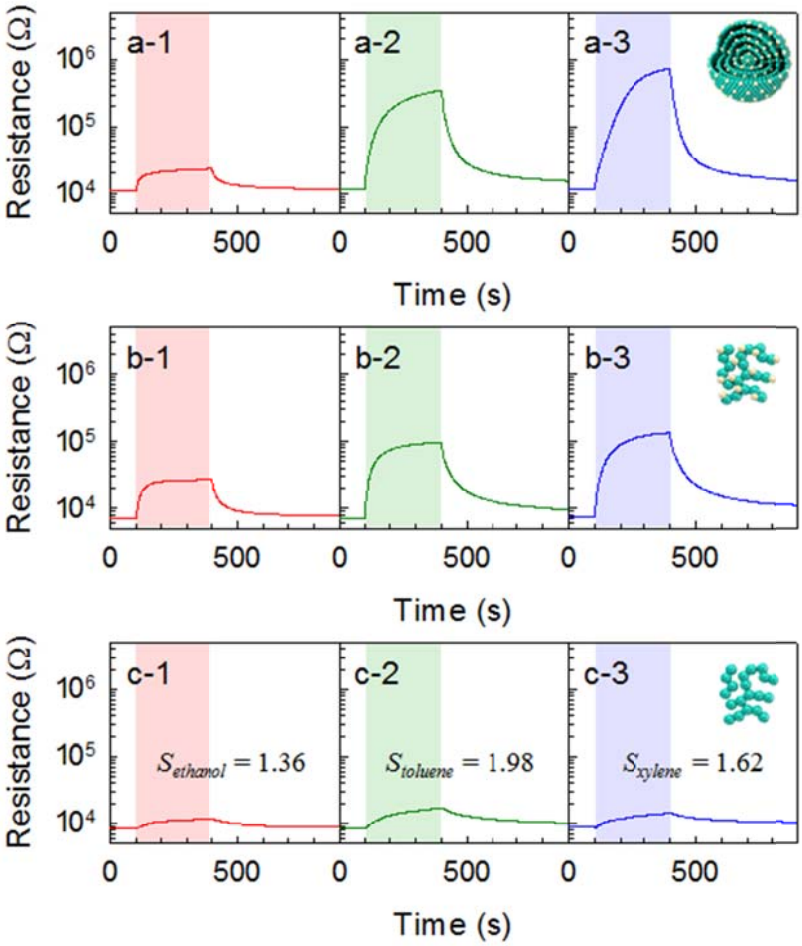

Figure S8. Gas-sensing transients of the (a-1, a-2, and a-3) Pd-Co_3O_4-MRs, (b-1, b-2, and b-3) Pd-Co_3O_4-NPs, and (c-1, c-2, and c-3) pure Co_3O_4-NPs to 5 ppm (a-1, b-1, and c-1) ethanol, (a-2, b-2, and c-2) toluene, and (a-3, b-3, and c-3) *p*-xylene at 250 °C, respectively.

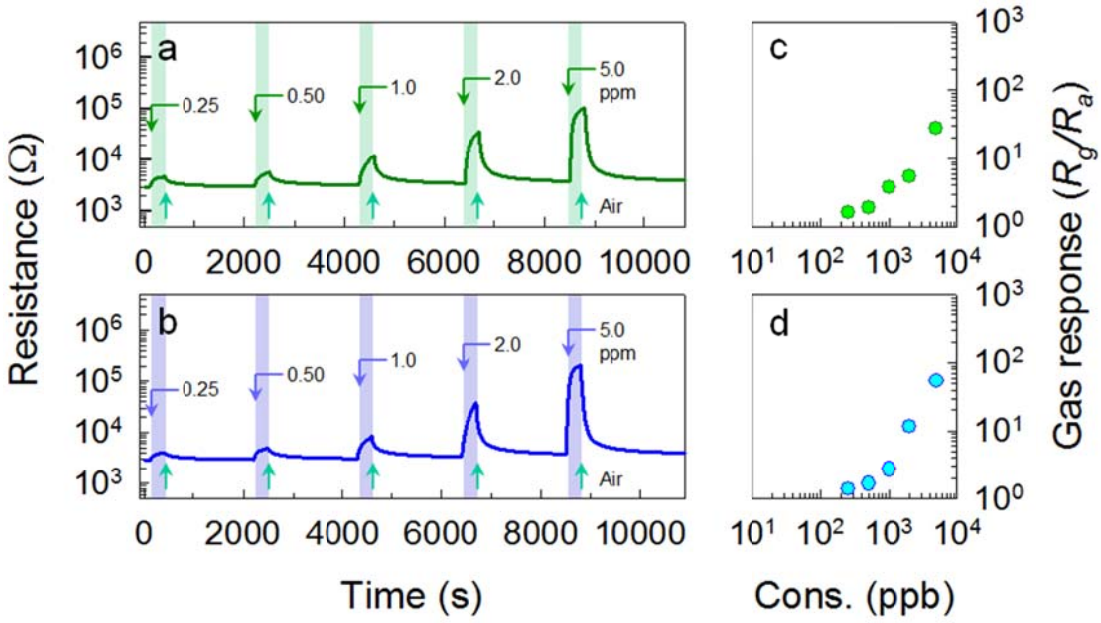

Figure S9. Gas-sensing transients of the Pd-Co_3O_4-MRs to (a) toluene and (b) *p*-xylene and gas responses to (c) toluene and (d) *p*-xylene as a function of concentration.