Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supplementary Information

Ultraselective detection of sub-ppm-level benzene using Pd-SnO_2 yolk-shell micro-reactors with catalytic Co_3O_4 overlayer for monitoring air quality

Seong-Yong Jeong,[a] Ji-Wook Yoon,[a] Tae-Hyung Kim,[a] Hyun-Mook Jeong,[a]

Chul-Soon Lee,[a] Yun Chan Kang[a] and Jong-Heun Lee[a,*]

[a] Department of Materials Science and Engineering, Korea University, Seoul 02841, Republic of Korea.

*E-mail: *Jong-Heun Lee, jongheun@korea.ac.kr*

SUPPLEMENTARY FIGURES

Figure S1

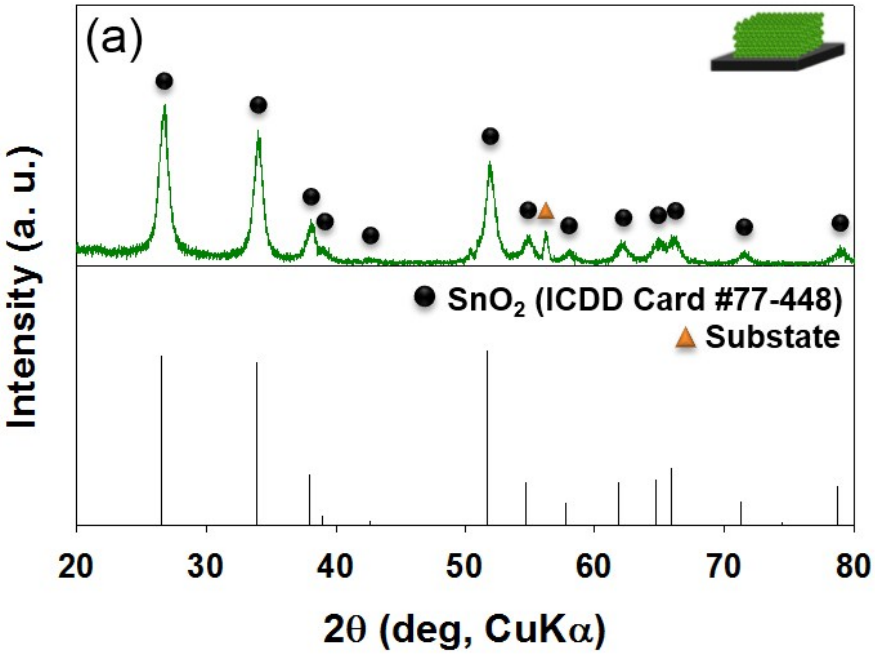

Figure S1 XRD pattern of the Pd-SnO_2 film.

Figure S2

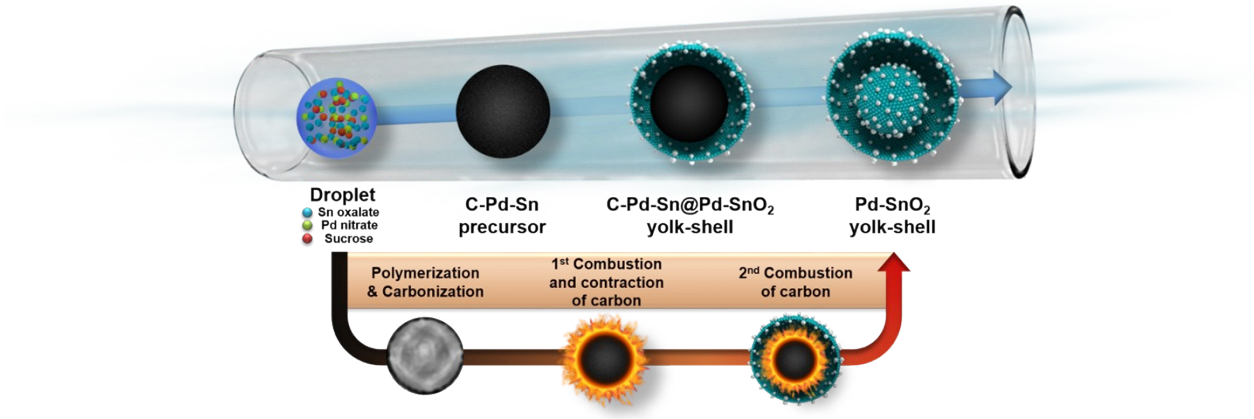

Figure S2 The formation mechanism of the Pd-SnO_2 yolk-shell spheres.

Figure S3

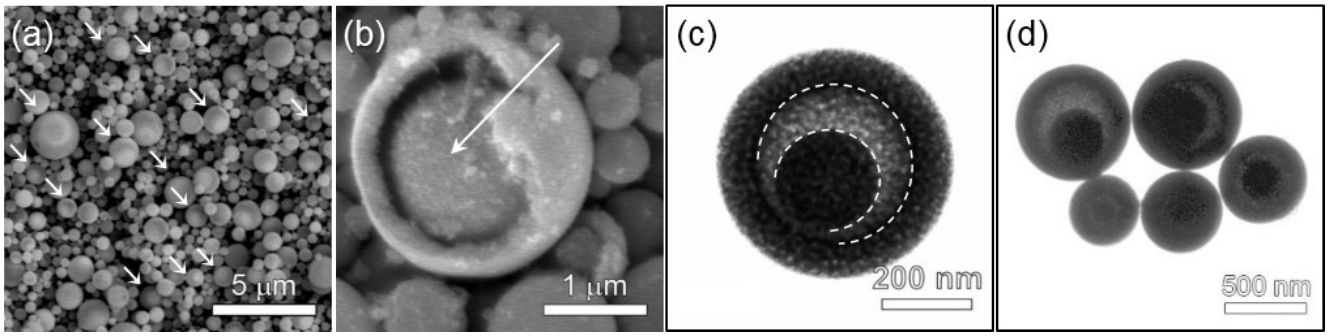

Figure S3 (a,b) SEM and (c.d) TEM images of Pd-SnO_2 yolk-shell spheres.

Figure S4

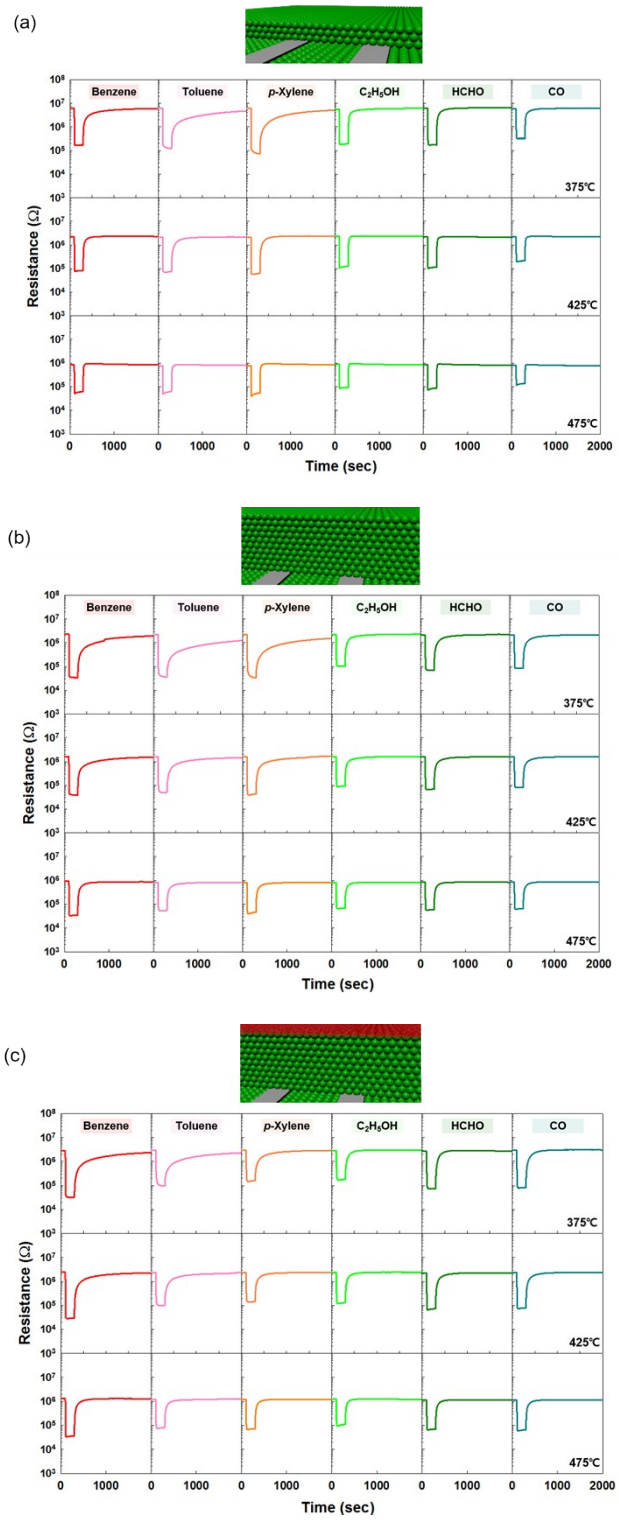

Figure S4 Gas -sensing transients of the (a) Pd-SnO_2(1) sensor, (b) Pd-SnO_2(3) sensor, and (c) Co_3O_4(20)/Pd-SnO_2(3) sensor (Concentration of the analyte gas: 5 ppm).

Figure S5

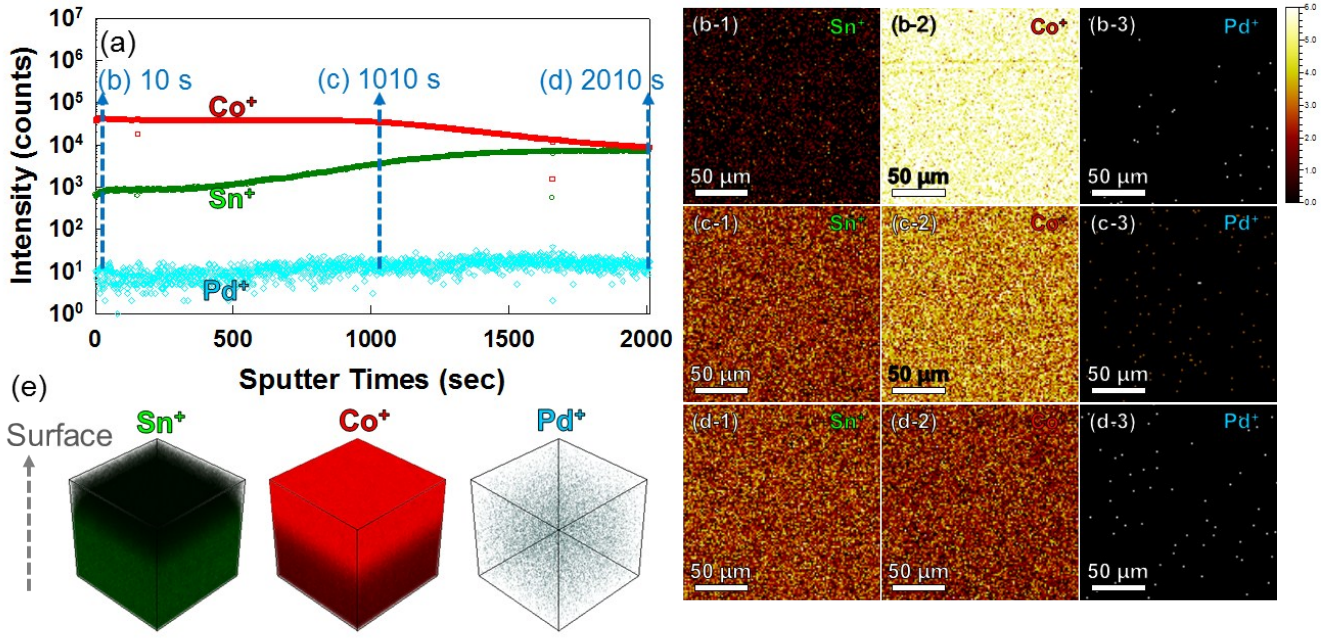

Figure S5 (a) TOF-SIMS depth profile of the Co_3O_4(20)/Pd-SnO_2(3) sensing film and Sn, Co, Pd elemental mapping at sputter times of (b) 10 s, (c) 1010 s, and (d) 2010 s; (e) three-dimensional composition image with sputter time.

Figure S6

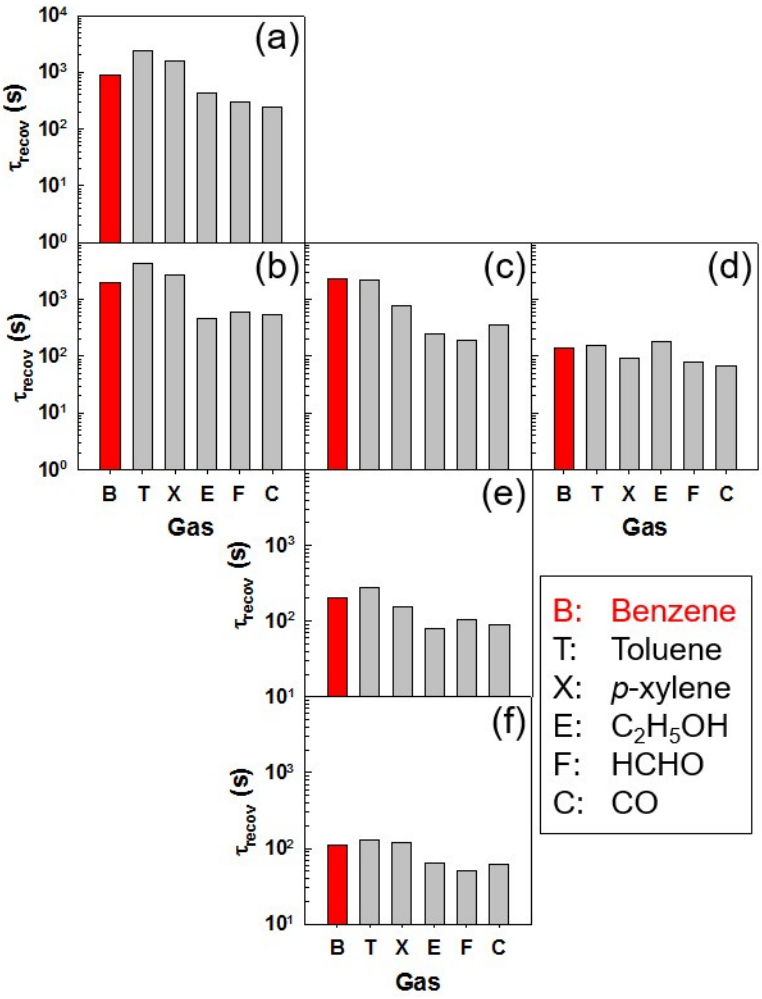

Figure S6 90% recovery time of the (a) Pd-SnO_2(1) sensor, (b) Pd-SnO_2(3) sensor, (c) Co_3O_4(20)/Pd-SnO_2(3) sensor, (d) Co_3O_4(80)/Pd-SnO_2(3) sensor, (e) Co_3O_4(20)/Pd-SnO_2(5) sensor, and (f) Co_3O_4(20)/Pd-SnO_2(8) sensor upon exposure to air after sensing of 5 ppm benzene (B), toluene (T), *p*-xylene (X), C_2H_5OH (E), HCHO (F), and CO (C) at 375 ^oC

Figure S7

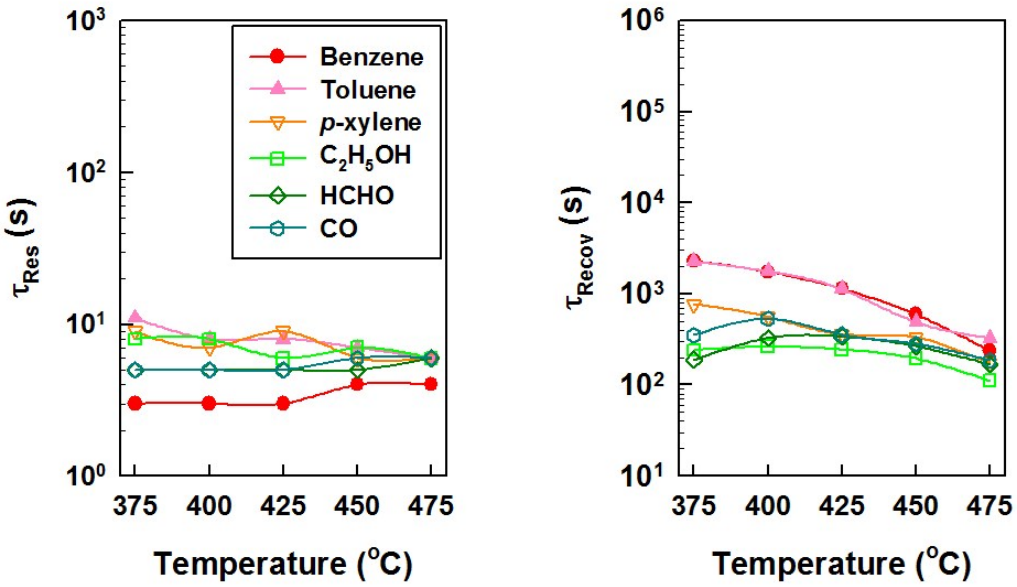

Figure S7 (a) 90% response time (τ_{res}) and (b) 90% recovery time (τ_{recov}) of the Co_3O_4(20)/Pd-SnO_2(3) sensor at temperatures in the range of 375–475 °C.