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

Supporting Information

Bi-functional Co-sensitization of Graphene Oxide Sheets and Ir Nanoparticles on P-type Co_3O_4 Nanofibers for Selective Acetone Detection

Seon-Jin Choi,[a] Won-Hee Ryu,[b] Sang-Joon Kim,[a] Hee-Jin Cho[a] and Il-Doo Kim*,[a]

[a]Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology, Daejeon 305-701, Republic of Korea

[b]Department of Chemical and Environmental Engineering, Yale University, New Haven, Connecticut 06520-8286, United States

* Corresponding author. Tel.: +82-42-350-3329; fax: +82-42-350-3310.

E-mail addresses: idkim@kaist.ac.kr (I.D. Kim).

Supporting experimental section

Synthesis of Ir nanoparticles (NPs) 0.5 g of H_2IrCl_6 was dissolved in 75 mL EG under magnetic stirring at room temperature. Then, the H_2IrCl_6 solution was heated to 100 °C for 1 h at a rate of 1 °C min^{-1}. The color of the solution changed gradually from dark to light brown. The synthesized solution was centrifuged at 3000 rpm for 10 min and washed with DI water multiple times to obtain colloidal Ir NPs. Ir nanoparticles were dispersed in ethanol, and these were directly used as the Ir catalyst for the functionalization of Co_3O_4 NFs. The synthesized Ir NPs exhibited an average diameter of 6 nm.

Figure S1

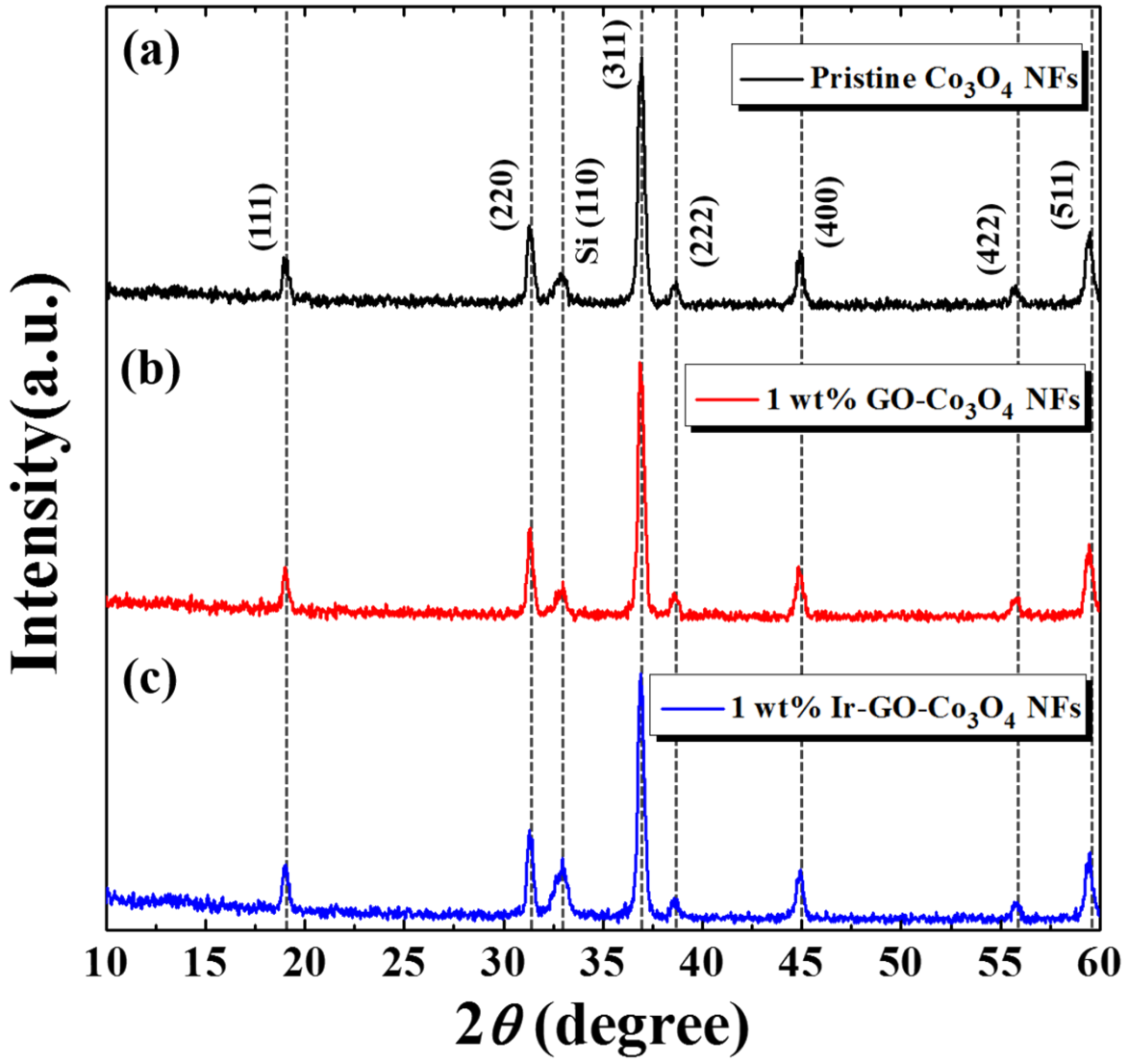

Figure S1. X-ray diffraction (XRD) analysis with the 2θ angle in the range of 10–60°: (a) pristine Co_3O_4 NFs, (b) 1 wt% GO-Co_3O_4 NFs and (c) 1 wt% Ir-GO-Co_3O_4 NFs

Figure S2

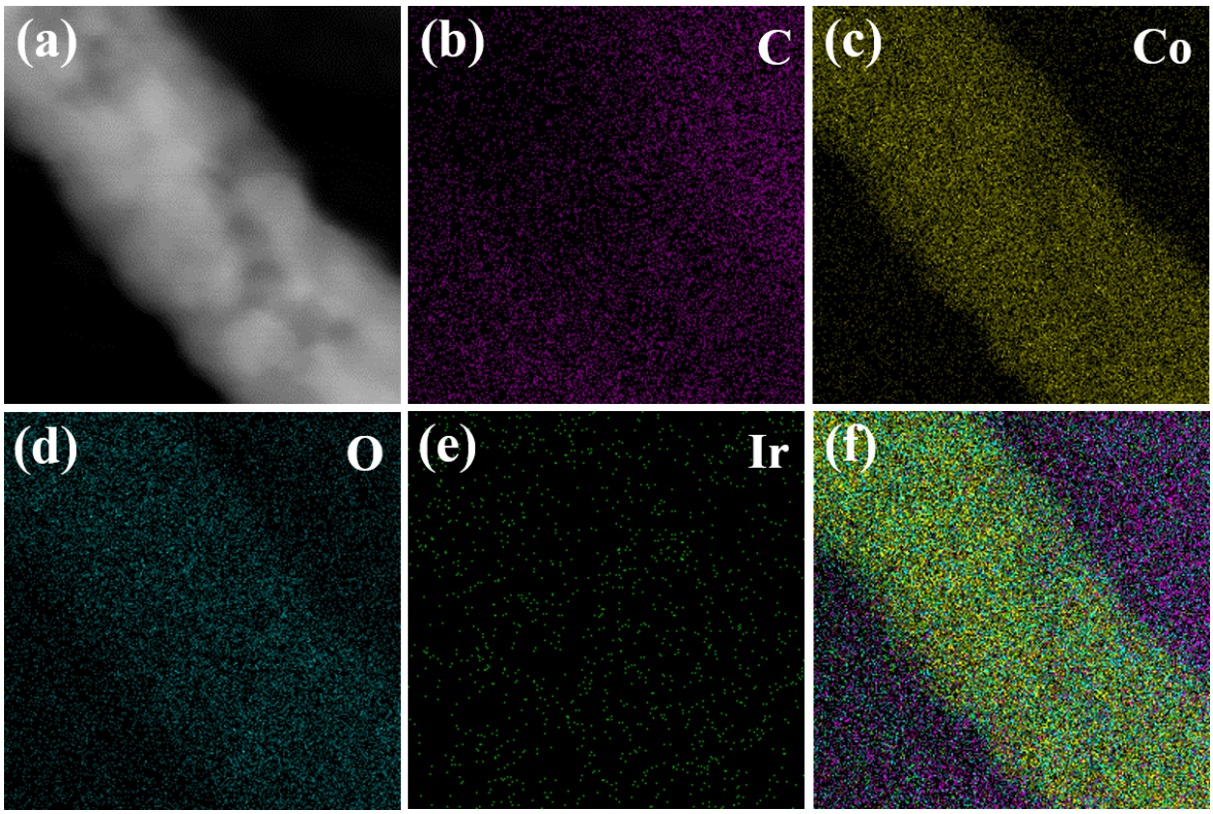

Figure S2. STEM image of of 1 wt% Ir-GO-Co_3O_4 NFs (a); and energy-dispersive X-ray spectroscopy (EDX) elemental mapping of: (b) carbon, (c) cobalt, (d) oxygen, (e) iridium, and (f) all components.

STEM image showed a 1wt% Ir-GO-Co_3O_4 NF which showed partially porous structure (Figure S1a). It was evidently confirmed that each component of carbon (C) (Figure S1b), cobalt (Co) (Figure S1c), oxygen (O) (Figure S1d) and iridium (Ir) (Figure S1e) as well as overlapped mapping of all components (Figure S1f) were identified.

Figure S3

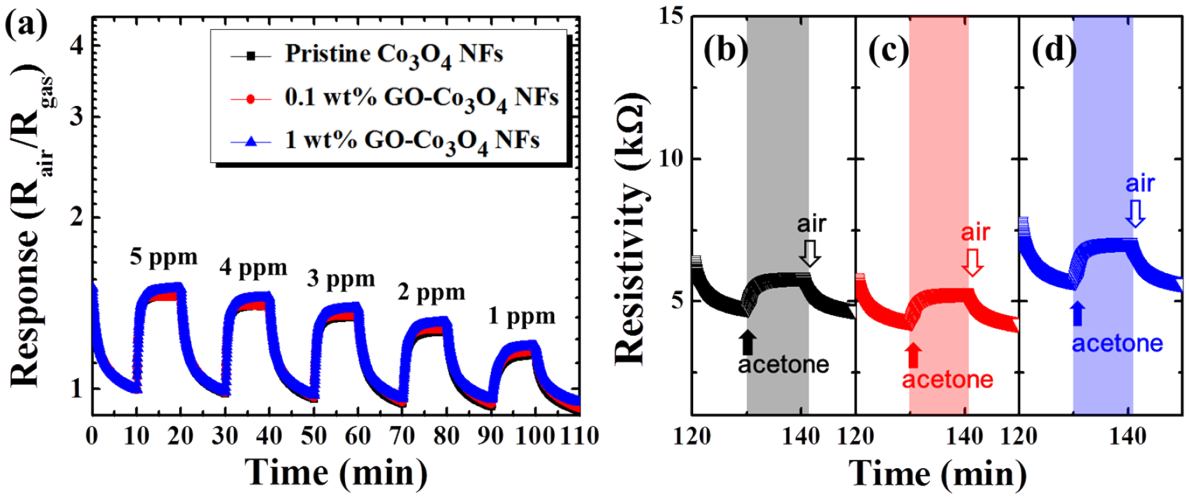

Figure S3 Response characteristics of pristine Co_3O_4 NFs, 0.1 wt% GO-Co_3O_4 NFs and 1 wt% GO-Co_3O_4 NF with acetone concentration range of 1–5 ppm at 300 °C (a); Dynamic acetone sensing transient of: (b) pristine Co_3O_4 NFs, (c) 0.1 wt% GO-Co_3O_4 NFs and (d) 1 wt% GO-Co_3O_4 NFs at the concentration of 1 ppm at 300 °C

Figure S4

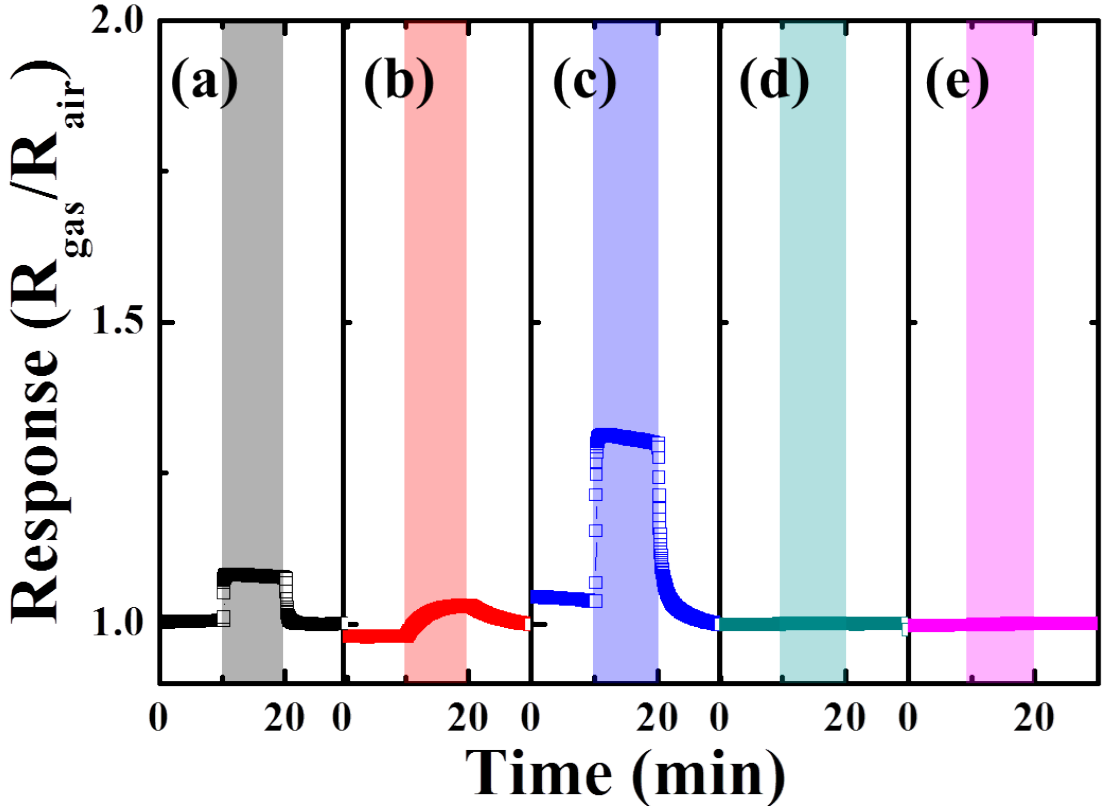

Figure S4 Sensing characteristics of GO-Ir composites toward 5 ppm acetone at 300 °C with different weight ratios of GO and Ir. (a) GO:Ir=9:1, (b) GO:Ir=7:3, (c) GO:Ir=5:5, (d) GO:Ir=3:7 and (e) GO:Ir=1:9

Figure S5

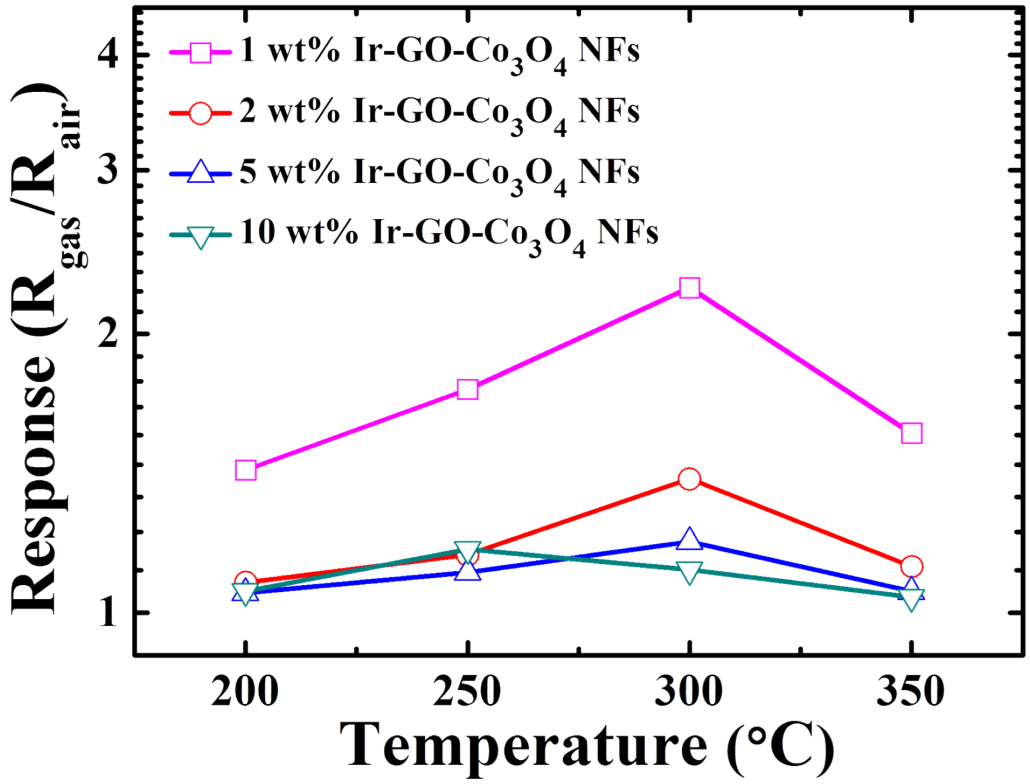

Figure S5 Temperature-dependent response properties in the temperature range of 200–350 °C with 1 wt% Ir-GO-Co_3O_4 NFs, 2 wt% Ir-GO-Co_3O_4 NFs, 5 wt% Ir-GO-Co_3O_4 NFs, and 10 wt% Ir-GO-Co_3O_4 NFs toward 5 ppm acetone